TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES

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I hereby declare that the thesis entitled "**TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES**" submitted towards partial fulfillment of the requirements for the award of **MD in Psychiatry** degree to BFUHS is a compilation of original work carried out by me under the supervision of **Dr. Navkiran Sooch Mahajan**, Professor, Department of Psychiatry, **Dr. Ranjive Mahajan**, Professor and Head, Department of Psychiatry and **Dr. Suman Puri**, Professor and Unit Head, Department of Obstetrics & Gynaecology. No part of this thesis has formed the basis for the award of any degree previously.

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Dedicated To
My Respected
Teachers, Family
&Friends

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Dr. Tanu

LIST OF ABBREVIATIONS

AD	Alzheimer's disease
ATP	Adenosine triphosphate
FSH	Follicle stimulating hormone
IMS	International Menopause society
IQCODE	Informant questionnaire on cognitive decline
LH	Luteinizing hormone
LMP	Last menstrual period
MMSE	Mini-mental state examination
PFC	Prefrontal cortex
PGIMS	PGI memory scale
SD	Standard deviation
STRAW	Stages of Reproductive Aging Workshop

ABSTRACT

INTRODUCTION*:* Cognitive impairment is a frequent complaint during the menopausal transition and among postmenopausal women. Changes in the memory correspond with diminished estrogen production. Many perimenopausal and postmenopausal women report sleep concerns, depression and hot flushes and these factors may contribute to cognitive decline. Symptoms reported are difficulty recalling words or numbers, needing memory aids and forgetting why one was involved in certain behaviour.

AIMS AND OBJECTIVES: To study impairment in neuropsychological performance in perimenopausal and postmenopausal females.

MATERIALS AND METHODS*:* The study was conducted on 50 perimenopausal and 50 postmenopausal females in the age group of 38-55 years presented to Department Of Psychiatry and obstetrics & gynaecology, DMC&H Ludhiana. Subjects were assessed using MMSE, PGI memory scale and IQCODE Scale.

RESULTS: While comparing the MMSE domains between Perimenopausal and postmenopausal groups; few of the domains varied significantly like mean value for Orientation for perimenopausal age group was 9.42+/- 0.53 and for postmenopausal it was 9.00+/- 0.45 and mean value for Attention & Concentration for perimenopausal age group was 3.76+/- 0.71 and for postmenopausal it was 3.44+/- 0.50. While comparing the PGI memory scale and its domains between Perimenopausal and postmenopausal groups; few of the domains varied significantly like mean value for Attention & Concentration for perimenopausal age group was 2.96 +/- 0.49 and for postmenopausal it was 3.32+/- 0.65 , mean value for Delayed Recall in case of perimenopausal age group was 2.06+/-0.42 and for postmenopausal age group was 3.1+/-1.35 and for Recognition mean value in case of perimenopausal age group was 3.72+/-0.53 and for postmenopausal age group was 2.96+/-0.28 . In IQCODE, Overall significantly higher mean value of total IQCODE score was observed in postmenopausal (3.34+/-0.10) than perimenopausal women (3.24 +/- 0.09).

CONCLUSION: These results help us to understand that decline in estrogen around menopause are associated with decline in cognitive functioning. Post menopausal females have worse performance in different domains of cognition which may require intervention.

KEYWORDS: *Cognition, perimenopause, postmenopausal stage, attentionl, menopausal transition, neurocognitive impairment.*

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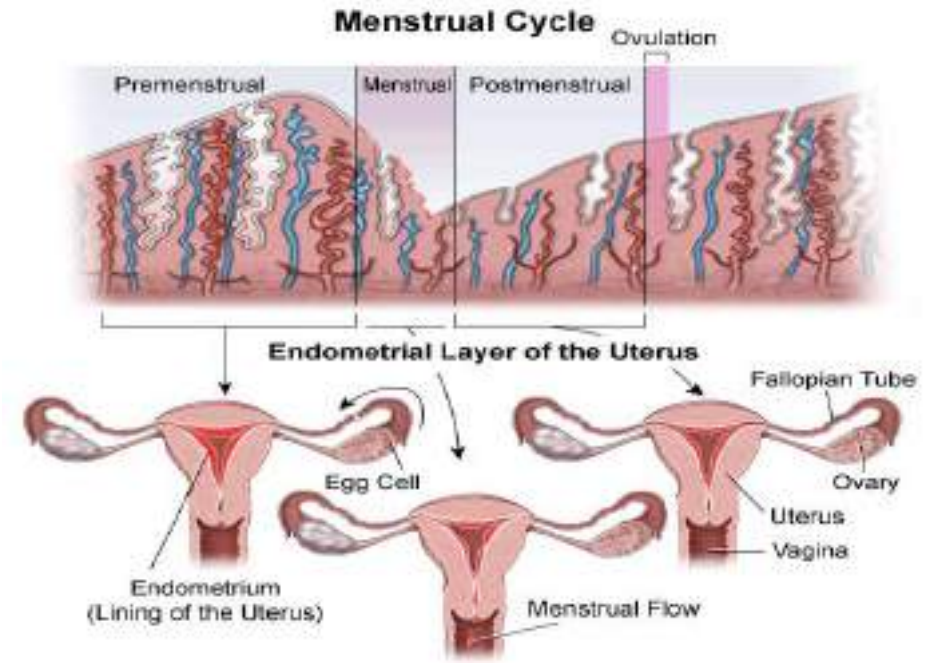
INTRODUCTION

The female reproductive axis is unique in that it reaches a senescent state when other organs in the body are generally healthy. The process of oocyte depletion, which begins before birth and ends with menopause, cannot be predicted precisely by chronological age, as its age of onset varies greatly between women [1].

Menstruation is the monthly shedding of the functional layer of the uterine endometrial lining that occurs when ovulation is not followed by fertilization. It occurs approximately every 28 days, with a range from every 21 to every 45 days. The average age of onset of menarche is 12.4 years. Menarche is commonly associated with the ability to ovulate and reproduce. However, the appearance of menarche does not guarantee either ovulation or fertility [2].



A clinical staging system exists, which makes it possible to identify where a woman is in her process of reproductive aging based on her bleeding patterns, which is a better predictor than her age. Staging is

useful for several reasons, among them providing a means to attribute women's symptoms during this time to menopausal changes, predicting time to final menstrual period, and identifying health risks. There are now well described symptoms that are linked to specific time points along the menopausal transition, thus validating the concept that menstrual cycle disruption, along with its underlying hormonal changes, are responsible for the common symptoms of the menopausal transition/ climacteric phase.

The term ‘climacteric’ derives from the Greek (klimater step), indicating a process that has stages. The IMS defines it as ‘the phase in the aging of women is marking the transition from the reproductive phase to the non-reproductive state’, adding. ‘This phase incorporates the perimenopause by extending for a longer variable period before and after the perimenopause’. Furthermore, ‘perimenopause’, a term still in common usage that means the time around menopause, has been a very loose concept that was recently more precisely defined in the Stages of Reproductive Aging Workshop (STRAW+10) as including all the ‘menopausal transition stage’ (Stages-2 and-1) plus only the first year (Stage 1a) of the ‘early postmenopause stage’ (Stage 1) , i.e. until the diagnosis of menopause is ratified by 12 months of amenorrhea, a period which in this case is shorter than that defined by the IMS as perimenopause[3].

Variation in the length of the menstrual cycle occurs in response to variations in hormone levels. The follicles in the ovary atrophy continuously during a woman’s life. This phase is the transition to menopause and is termed as premenopausal period. Finally, the cessation of menstruation occurs known as menopause. The period of life after menopause is termed post menopause [4].

The menopause occurs when the pool of ovarian follicles becomes depleted. In the years leading up to the menopause, there can be variability in the length of the menstrual cycle, frequency of ovulation, and concentrations of reproductive hormones. There are many

hypotheses but little is known about the exact mechanisms involved.[5] With ovarian aging, the concentrations of FSH increase in the early follicular phase of the menstrual cycle. This leads to earlier oestradiol elevations and thus a shortened follicular phase with earlier or faster growth of the follicle.[6] In contrast, the length of the luteal phase remains the same, as does the level of progesterone, until very late in the aging process. This, in turn, leads to shorter cycles. In addition, it has been shown that the concentrations of both inhibin A and inhibin B are affected by ovarian aging, as is the concentration of anti-mullerian hormone. Since the DF produces most of the circulating oestradiol, the concentration of circulating oestradiol falls dramatically after the menopause. As a result of this, secretion of FSH and LH from the anterior pituitary gland increases due to the lack of negative feedback from oestradiol. This gives rise to the postmenopausal state of hypergonadotrophic hypogonadism [7].

India has a large population, which has already crossed the 1 billion mark with 71 million people over 60 years of age and the number of menopausal women about 43 million. Projected figures in 2026 have estimated the population in India will be 1.4 billion, people over 60 years 173 million, and the menopausal population 103 million. Average age of menopause is 47.5 years in Indian women with an average life expectancy of 71 years [8] Globally average age of menopause is 51.5 years, with most women experiencing menopause between the ages of 45 and 55 years[9].

The obvious symptom is the cessation of menses typically heralded by changes in the menstrual cycle.

Approximately, 75% of women experience vasomotor symptoms. These symptoms include hot flashes, night sweats, palpitations, and migraines. Hot flashes often last approximately three to four minutes at unpredictable intervals. They may be worsened by alcohol, eating, emotional stress, and exertion. Migraines may change in intensity and severity. Migraines without aura are more common than migraines with

aura. Migraines with aura have an increased risk of stroke, especially if women smoke or use oral contraceptives. Other types of headaches such as cluster and tension headaches may also increase with a change in hormone levels.

Approximately 60% of women experience urogenital symptoms. These symptoms include vaginal atrophy, urethral atrophy, and sexual dysfunction (i.e., a decline in libido). Vaginal atrophy results in dryness, pruritus, and dyspareunia (painful intercourse). Urethral atrophy results in stress incontinence, frequency, urgency, and dysuria.

Approximately 45% of women experience psychogenic symptoms. These symptoms include anger/irritability, anxiety/tension, depression, sleep disturbance, loss of concentration, and loss of self-esteem/confidence [9].

The increased risks of cardiovascular diseases are common and noticeable symptoms of loss of ovarian hormones. Apart from the estrogenic action in the hypothalamus affecting ovulation and reproductive behavior, it is now apparent that the brain is one of the organs that suffer greatly from estrogen loss after surgical or natural menopause. Moreover, many women sufferings from difficulties in remembering names, a deficit in motor coordination, depression, and anxiety[10].

Memory decline is a very common complaint throughout the menopausal transition. Alzheimer's disease (AD) is the most common neurodegenerative disease, comprising higher than 50% of all dementia types.[11,12]

Women are twice more prone to AD due to increased longevity, the sex difference in brain size. There is a higher possibility of developing AD in postmenopausal women than their male counterparts. Cognitive abilities deteriorate across aging in humans, mostly for women. Apart from aging, ovarian production of estrogen and progesterone markedly decreased after menopause [13].

The previous report revealed that 62-70% of postmenopausal women report noticeable cognition deficits. Neurotrophic action of estrogen has been found in areas involved in memory and cognition.[14,15]

Studies showed that 17-beta estradiol protects against beta-amyloid-induced damage and tau-related changes. Furthermore, magnetic resonance imaging (MRI) studies revealed that 17- beta estradiol increases the blood flow to the hippocampus and cortex. Allowed to promote the growth and survival of cholinergic neurons, hippocampal neurons become dense which finally contributes synaptic plasticity in the hippocampus and enhance the short and long-term memory.[16,17]

Pathogenesis

Oxidative stress is the main culprit associated with the pathogenesis of numerous cognitive dysfunction, such as memory impairment, age-related dementia, Alzheimer's disease [18,19].

Free radical oxidation of Glutathione (GSH) and the unsaturated fatty acids are commonly found in cognitive diseases. Free radical scavengers and antioxidants inhibit the progression of neurodegenerative disorders like dementia, Alzheimer's, etc. as suggested in these cases[20].

Estrogen decreases the generation of oxygen free radicals by stabilizing membrane potential and prevent adenosine triphosphate (ATP) depletion. Estrogenic action on mood, locomotor activity, pain sensitivity, and cognition are mediated by binding nuclear intracellular receptor estrogen receptor alpha (ER-alpha) and estrogen receptor beta (ER-beta) on basal forebrain, hippocampus, cerebral cortex, midbrain raphe and spinal cord[21,22].

AIMS AND OBJECTIVES

To study impairment in neuropsychological performance in perimenopausal and postmenopausal females.

REVIEW OF LITERATURE

Menopause is considered to be a marker of biological ageing in women.[23] Menopause is one of the most significant stages in female reproductive life cycle where there is a transition from reproductive to non reproductive stage. This brings in a number of physiological changes that affect the life of a woman permanently. It sets the stage for ageing and accelerates the process of non-communicable disorders. Historically the association of menopause and its symptoms was noted in 1777 by John Leake[24].

A study was conducted by Avis et al. (2001) to determine the variation in symptom occurrence and reporting of mid aged women across different menopausal status among 14906 ethnically, racially, and culturally diverse women in the United States. Controlling for age, education, health, and economic status, the classical menopause symptoms like hot flushes and night sweats were more likely to be reported by African-American women; whereas psychosomatic symptoms were more likely to be reported by Caucasian women. Asian women were significantly less likely to report vasomotor symptoms than any other ethnic group. 8 Perimenopausal women reported more psychosomatic symptoms than pre- or postmenopausal women. Perimenopausal women, hormone users, and women who had a surgical menopause reported significantly more vasomotor symptoms. The factors associated with symptom reporting were education; self assessed health (negative association) and economic constraints (positive association). The symptoms depended not only on the physiologic changes during woman's midlife but also on ethnicity[25].

A pioneer study conducted by **Mitchell E and Woods N (2001)** "The Seattle Midlife Women's Health Study" reported that of 230 women aged 33 to 55 years who were interviewed about their perceived cognitive function, 60% noticed an unfavorable memory change "over the past few years." In this cross-sectional survey, women reported

problems with recall of words and numbers, disruptions in everyday behavior (eg, losing household items), difficulty concentrating, needing to use memory aids, and forgetting events (eg, appointments). Factors that were associated with perceived memory dysfunction were being a worker, job stress and multiple life roles—but not perimenopause transition stage— suggesting that the perceived memory difficulties were predominantly a function of stress and multiple burdens resulting in diminished attention and concentration[26].

A study in Sweden conducted by **Li et al. (2003)** among a large sample of middle aged women identified the determinants of menopause related symptoms such as sociodemographic characteristics, life style, and other health problems. It also laid emphasis on 9 importance of considering these factors in understanding menopause related symptoms as they have a direct and modifiable effect on existence of menopause related symptoms[27].

The prevalence of menopause related symptoms in nine Asian ethnic groups was assessed in Pan-Asia menopause study conducted by **Haines et al. (2005)** the symptoms were significantly different between ethnic groups and in each ethnic group the proportion of women reporting each symptom varied. Hot flush prevalence ranges from 5 percent of Indonesian women to 100 percent in Vietnamese women. The commonest menopausal symptom prevailing in Asian region were body and joint aches and pains [28].

Amin Z and associates (2006) conducted one open label study randomized 19 early menopausal women to either a tryptophan depletion procedure (a reversible pharmacologic challenge that results in low levels of serotonin) or a sham (control) procedure before and after 8 weeks of transdermal estradiol treatment. Verbal memory decreased significantly after the tryptophan depletion challenge, but estradiol treatment buffered this effect. Spatial learning did not decrease significantly as a result of tryptophan depletion; estrogen had no influence on spatial learning. In addition, estradiol enhanced mood

on the day after the depletion challenge. This study provides experimental support for the beneficial effect of estrogen on serotonergic function in relation to both memory and mood[29].

In a cross-sectional research conducted by **Monterrosa et al.(2008)** found that Afro Colombian was more vulnerable to menopausal somatic and psychological symptoms, and low quality of life. Black race, low socioeconomic status, lower educational status, obesity of Afro-Hispanic women in Latin America were the risk factors for symptoms of somatic (mostly influenced by heart discomfort and muscle and joint problems) and psychological problems[30].

Another study conducted in Japan by **Ishizuka et al. 2008** using a self-administered questionnaire about menopausal symptoms among women who were 50 years or more found that four menopause related symptoms, viz, hot flushes, sweats, depression and insomnia were more prevalent among post-menopausal women. These four symptoms were also associated with socio psychological and life style factors and BMI[31].

A very pioneer study called as "**Study of Women's Health Across the Nation**" (SWAN) conducted by **Greendale GA (2010**) reported a cross-sectional association between self-reported forgetfulness and being perimenopausal. Forgetfulness was common in middle age: In this sample of 12,425 women aged 40 to 55 years, unadjusted for sociodemographic factors, 31% of premenopausal, 44% of early or late perimenopausal, and 42% of naturally menopausal women endorsed forgetfulness. After adjustment for race/ethnicity, age, education, economic hardship, marital status, parity, body size, health habits, and symptoms of anxiety, depression and poor sleep, perimenopausal women were 1.4 times more likely to report forgetfulness than premenopausal women. Thus, in the SWAN cross-sectional survey, self-reported forgetfulness did seem to be related to perimenopause independently of several relevant characteristics, including stress symptoms.[32]

In a study conducted by **Rahman et al. (2010)** among 356 participants in Malaysia in the age group 40-65 years using a modified menopause rating scale found that 35%-45% postmenopausal women reported major symptoms like joint and muscular discomfort, physical and mental exhaustion, anxiety, depressive mood, irritability. The symptoms in perimenopause and post menopause had statistically significant differences when compared to premenopausal women. Post menopausal women experienced more urogenital issues[33].

One study conducted by **Lejsková et al. (2011)** in Prague among randomly selected population of 909 women aged 45-54 years (women in reproductive age and post menopause) to compare the effects of insulin resistance as a part of metabolic syndrome which increases during menopause showed that transition to menopause is an associated risk factor for manifestation of the Metabolic syndrome in middle aged women. Visceral (abdominal) obesity which can be assessed by the waist circumference is one of the easily measured components of metabolic syndrome. The study is indicative of the importance of the preventive aspects of metabolic syndrome manifestation in the menopause transition by reducing the risk in the reproductive age group, which may be accelerated by menopause[34].

Another study conducted in Brazil by **Oppermann et al. (2012)** in a multi ethnic group of women to examine the association between psychiatric disorders in different phases of menopause with physical, psychological menopause related symptoms, using a standardized tool found that women in menopausal transition showed higher rates of vasomotor symptoms and vaginal dryness with significant associations with minor psychiatric disorder. The same study found that memory loss was associated with menopausal transition and perimenopause, which has a positive relation with minor psychiatric disorders. The cumulative factors resulting from menopause with low educational status is an indicator of minor psychiatric ailments; low sociodemographics and psychological factors leading to more non

specific somatic and psychological symptoms. The study recommended educational intervention and special focus on critical window of menopausal transition[35].

A study conducted in Japan by **Terauchi et al. (2012)** to assess the correlation between somatic and psychological symptoms of menopause and effect of insomnia on anxiety and depression found that psychological symptoms were more prevalent, and that anxiety caused difficulty in initiating sleep and depression resulted in non-restorative sleep. Insomnia was highly prevalent among peri- and post-menopausal female patients in this clinical setting[36].

A systematic review was carried out by **Weber MT and associates in 2014** to synthesize the existing studies of the relationship between menopausal stage and neuropsychological performance and depression. Four cross-sectional studies on menopausal transition stage and cognitive function and four longitudinal studies on menopausal transition stage and risk of depression, as measured by symptom inventories and structured clinical interviews, were selected. For the cognitive outcomes, fixed effects models were used to estimate overall standardized effect sizes. For the depression outcomes, the results of group comparisons were summarized using the log odds ratio and its estimated standard error. Postmenopausal women performed significantly worse than pre- and perimenopausal women on delayed verbal memory tasks, and significantly worse than perimenopausal women on phonemic verbal fluency tasks. Peri- and postmenopausal women were at significantly increased risk of depression, as measured by standard symptom inventories and structured clinical interviews, than premenopausal women. The menopausal transition is a time of increased vulnerability to cognitive declines and increased risk of depressive symptoms and depressive disorders. However, these results cannot necessarily be generalized beyond the studies included in this review[37].

A study conducted in West Bengal by **Dasgupta et al. (2015)** among

women aged 40 and 55 years, who had attained natural menopause, suggested that menopausal health of women is influenced by menstrual, reproductive history, sociodemographic variables, lifestyle, genetic and access to adequate health care. The study determined that variation exists in the menopausal experience and its sociodemographic and reproductive factors can be related to difference in ethnicity[38].

In a Brazilian study conducted **Politano et al. (2015)** aimed to examine the association of metabolic syndrome and sexual function in a cohort of women who were attending the menopausal clinic; found no association between sexual dysfunction and components of metabolic syndrome in women aged 40-60 years[39].

Berent-Spillson A and associates (2015) carried out a randomized placebo-controlled pilot study among 29 recently postmenopausal women; they used functional MRI and neuropsychological measures to separately assess the effects of estrogen or progesterone treatment on visual and verbal cognitive function. Women were randomized to receive 90 days of either estradiol or progesterone counterbalanced with placebo. After each treatment arm, women were given a battery of verbal and visual cognitive function and working memory tests, and underwent functional MRI including verbal processing and visual working memory tasks. They found that both estradiol and progesterone were associated with changes in activation patterns during verbal processing. Compared to placebo, women receiving estradiol treatment had greater activation in the left prefrontal cortex, a region associated with verbal processing and encoding. Progesterone was associated with changes in regional brain activation patterns during a visual memory task, with greater activation in the left prefrontal cortex and right hippocampus compared to placebo. Both treatments were associated with a statistically nonsignificant increase in number of words remembered following the verbal task performed during the fMRI scanning session, while only progesterone was associated with

improved neuropsychological measures of verbal working memory compared to placebo. These results point to potential cognitive benefits of both estrogen and progesterone[40].

A Pan Indian Study conducted by **Ahuja (2016)** across 21 cities among 2184 women in menopausal transition and post menopausal found that the mean menopausal age of the Indian women was 45.59 years (including women whose menopause was induced) and the average age at natural menopause of the Indian woman was 46.2 years. Age at menopause in different regions of India was as follows: East 45.1 years, West 45.5years, North 45 years, South 44.7 years, and Central region 43.1 years. Higher education, high socioeconomic status with better nutritional status, multiple reproductive choices, low stress experience, access to better heath resources and medical care, longer marriage duration were positively associated with late age at menopause[41].

Unkenstein AE et al. (2016) examined women's subjective perception of memory and their objective memory performance across the menopausal transition. One hundred thirty women, aged 40 to 60 years were recruited from outpatient Menopause and Gynaecological clinics at the Royal Women's Hospital, Melbourne. Women were divided into menopausal stage groups according to the Stages of Reproductive Aging Workshop criteria based on menstrual patterns. All women completed self-report measures of depressive, anxiety, vasomotor, and sleep symptoms; attitude to menopause; and various aspects of memory, including memory contentment, frequency of forgetting, sense of control over memory, and use of memory strategies. Women also completed a comprehensive neuropsychological evaluation assessing memory and executive function. Comprehensive neuropsychological assessment showed no difference between premenopausal (n=36), perimenopausal (n=54), and postmenopausal (n=40) groups in performance on memory and executive tasks. Perimenopausal women, however, reported significantly more frequent forgetting ($P<0.01$) and

less contentment with their memory (P<0.01) than pre- and postmenopausal women. Although no impairment was observed in neuropsychological performance, when compared with pre- and postmenopausal women, perimenopausal women were more likely to be dissatisfied with their memory. During the menopausal transition women with a more negative attitude to menopause and more intense depressive, anxiety, vasomotor, and sleep symptoms are more vulnerable to feeling less content with their memory[42].

Arsani N et al. (2018) carried out a descriptive correlational quantitative observational study with a cross sectional study approach to study the relationship between cognitive impairment and the onset of menopause among total sample of 73 people. The results showed that 18.4% of elderly women experience definite cognitive impairment, 23% probale cognitive impairment, and 58.6% normal cognitive function. The relationship between cognitive impairment and the onset of menopause was obtained p value 0.296 which indicates that the correlation between the onset of menopause and cognitive function was not statistically significant. The relationship between cognitive impairment in elderly and level of exercise activity obtained a p value of 0,000 which indicates that the correlation between exercise activity and cognitive function is statistically significant [43].

Karishma et al. (2020) checked the cognitive function changes in later period of life after menopause. Based on Inclusion and Exclusion criteria 100 subjects above the age of 50 years was selected by purposive sampling and informed consent was taken. Groups were divided into four categories Group A, B, C and D and assessed on the basis of ACE-R questionnaire. The data was then be collected, compiled and analyzed. ACE-R Questionnaire Data was meaningfully assorted through calculation of mean & standard deviation. The p-value for age and menopause was 0.879 which was >0.001. There was negative correlation between age and menopause. Result was non-significant for attention and concentration within the groups of

menopausal stages with p value 0.120 which is >0.001. The p value for menopause and memory was <0.001 which signified that the relation between menopause and memory was significant. The p value for the language and menopausal stages was <0.001, which stated the result was significant between language and advancing menopausal stages. Menopause and visuospatial ability showed significant correlation with the p value <0.001, signified that the visuospatial abilities decline in women with advanced menopausal stage. In this study we found that there was significant decline in the various parameters of cognition including memory, verbal fluency, language, visuospatial abilities whereas age and attention concentration has negative correlation[44].

Rabeya K et al (2021) assessed memory, attention, and cognition function between pre- and post-menopausal groups. After preliminary screening and applying exclusion criteria, fifteen premenopausal women and fifteen postmenopausal women were finally selected. Different neuropsychological tests such as logical memory test, digit span test, letter cancellation test, trail making test and Stroop test were performed to evaluate the memory, attention, and cognition status. Blood estradiol level was also assessed by using commercial kits. Significant difference ($p<0.05$) was found in LM-II in logical memory test, digit span test (backward), letter cancelation test, TMT-B in trail making test, the score of part C in stroop test between premenopausal and postmenopausal women. Serum oestradiol concentration (pg/ml) was significantly lower ($p<0.001$) in postmenopausal women (44.18±10.52) than premenopausal women (175.48 ± 43.20). This study demonstrates that memory decline and cognitive dysfunction in postmenopausal women and there is a significant difference in estradiol level between pre and postmenopausal women. Estrogen has many neurotrophic actions in the brain and helps to improve memory and cognition. Therefore, estrogen replacement therapy, dietary supplements or a drug having an agonistic effect on estrogen receptors might improve the status of memory, attention, and cognitive function in postmenopausal women[45].

MATERIALS AND METHODS

SOURCE OF DATA:

Study was conducted on the perimenopausal and postmenopausal females of age group 38-55 years old presenting to Department of Psychiatry and Obs and Gynae in DMC&H, Ludhiana.

METHOD OF COLLECTION OF DATA

SAMPLE COLLECTION: The study was conducted on the perimenopausal and postmenopausal females of age group 38-55 years old presenting to Department of Psychiatry and Obs and Gynae in DMC&H, Ludhiana.

INCLUSION CRITERIA:

- Women who have given the consent for study.
- Age groups between 38-55 years.
- Females having premature ovarian failure having loss of normal ovarian function after age of 38 years presenting with symptoms of irregular menses, hot flushes and irritability.
- Perimenopausal females, who have irregular periods with intercycle gap of more than or equals to 60 days or having vasomotor symptoms.
- Postmenopausal females, who have not had periods for at least 12 months and are not using hormonal contraception, presenting to DMC&H, Ludhiana.

EXCLUSION CRITERIA:

- Age Less than 38 years and more than 55 years.
- Females with surgical menopause due to bilateral oophorectomy, irradiation and chemotherapy
- Females diagnosed with Alzheimer's disease and Pre senile dementia.
- History of pre-existing anxiety and depressive disorders.
- Any history of substance abuse.
- Females with intellectual disability.

- Females taking any cognitive enhancers.

METHODOLOGY:

The study was conducted on the 50 perimenopausal and 50 postmenopausal females in the age group of 38-55 years presenting to Department of Psychiatry and Obs and Gynae, DMC&H Ludhiana. After clinical assessment, socio-demographic Performa were filled. Subjects were further assessed using MMSE, PGI memory scale and IQCODE Scale.

TOOLS: TO BE ATTACHED HEREWITH

MINI MENTAL STATE EXAMINATION (MMSE)

PGIMS (PGI MEMORY SCALE)

IQCODE (INFORMANT QUESTIONNAIRE ON COGNITIVE DECLINE)

1. MINI MENTAL STATE EXAMINATION – was applied on the women of age group between 38-55 years old peri-menopausal females and postmenopausal females. It is 30-point questionnaire that is used to measure cognitive impairement. It includes 5 items that is Orientation (10 points), Registration (3 points), Attention and Calculation (5 points), Recall (3 points), Language and praxis(9 points).

   24-30 score =no cognitive decline

   18-23 score=Mild cognitive decline.

   0-17 score= severe cognitive decline.

2. PGI MEMORY SCALE: was administered on above the age of 20 years. It contains 10 sub tests-

   1. Remote memory
   2. Recent memory,
   3. Mental balance,
   4. Attention and Concentration,
   5 Delayed recall,
   6. Immediate recall,
   7. Verbal retention for similar pairs,

8. Verbal retention for dissimiliar pairs,
9. Visual retention,
10. Recognition.

3. INFORMANT QUESTIONNAIRE ON COGNITIVE DECLINE (IQCODE): It contains 16 questions. To score the IQCODE, add up the score for each question and divide by the number of questions 16. The result is a score that ranges from 1 to 5. An average score of 3 means that the subject is rated as “no change” and score of 4 means a “bit worse” and a score of 5 is “much worse”.

OUTCOME

To draw attention towards neurocognitive impairment in perimenopausal and postmenopausal females, who are at high risk, can experience cognitive decline affecting their day to day life. As there is increased risk of cognitive complaints, it’s important to work on different domains of cognition, so early and repeated assessment of cognition is recommended. In this study, the level and the severity of impairment is to be assessed.

Statistical Analysis

Data will be described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using ANOVA. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test will be used when the expected frequency is less than 5. A probability value (p value) less than 0.05 will be considered statistically significant. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

OBSERVATIONS AND RESULTS

The study was conducted on the 50 perimenopausal and 50 postmenopausal females in the age group of 38-55 years presenting to Department of Psychiatry and Obs and Gyane, DMC&H Ludhiana.

Table 1: Comparison of anthropometric measurements between the groups

Variables	Group				p-value
	Peri-menopausal		Post-menopausal		
	Mean	SD	Mean	SD	
Age (In years)	42.9800	3.56565	50.9600	2.84970	0.001 (Sig.)
Weight (Kgs.)	64.0600	8.77010	67.1000	10.98283	0.129 (NS)
Height (cm)	160.7200	2.00041	161.3400	1.22241	0.064 (NS)
BMI	25.0328	3.44351	26.1844	4.27466	0.141 (NS)

Test applied: Independent sample t-test

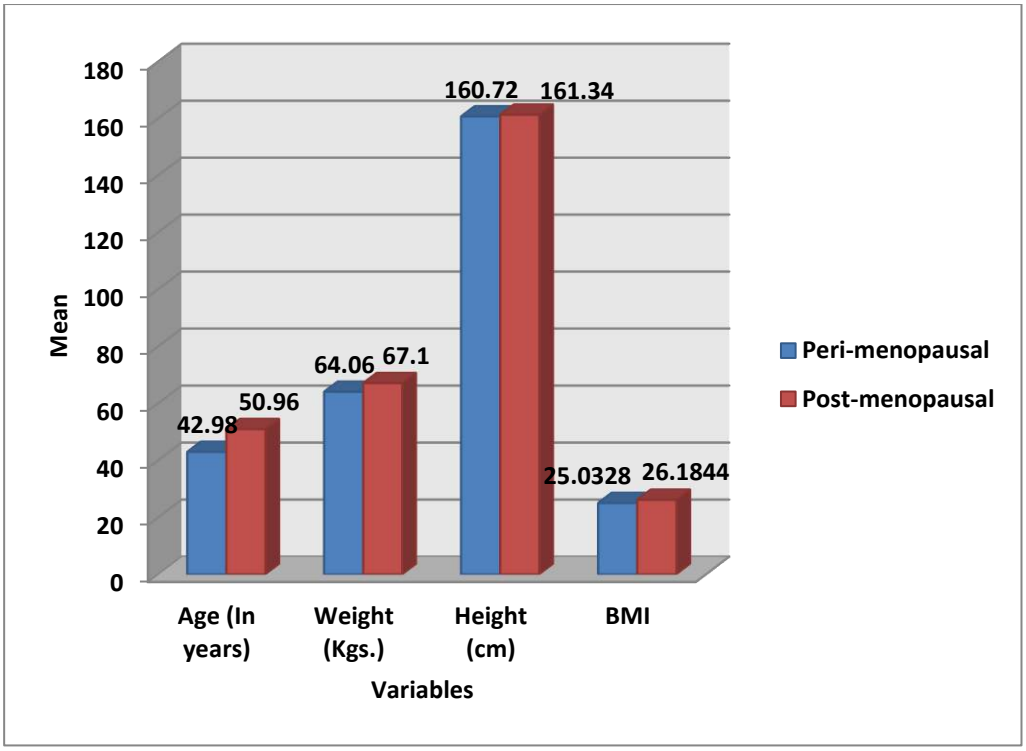


Figure1: Comparison of anthropometric measurements between the groups

Table 2: Comparative distribution of age (in years) between the groups

Age (In years)	Group		Total
	Peri-menopausal	Post-menopausal	
38-45	42	3	45
	84.0%	6.0%	45.0%
46-50	6	20	26
	12.0%	40.0%	26.0%
51-55	2	27	29
	4.0%	54.0%	29.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	0.001 (Sig.)		

Test applied: Chi-square test

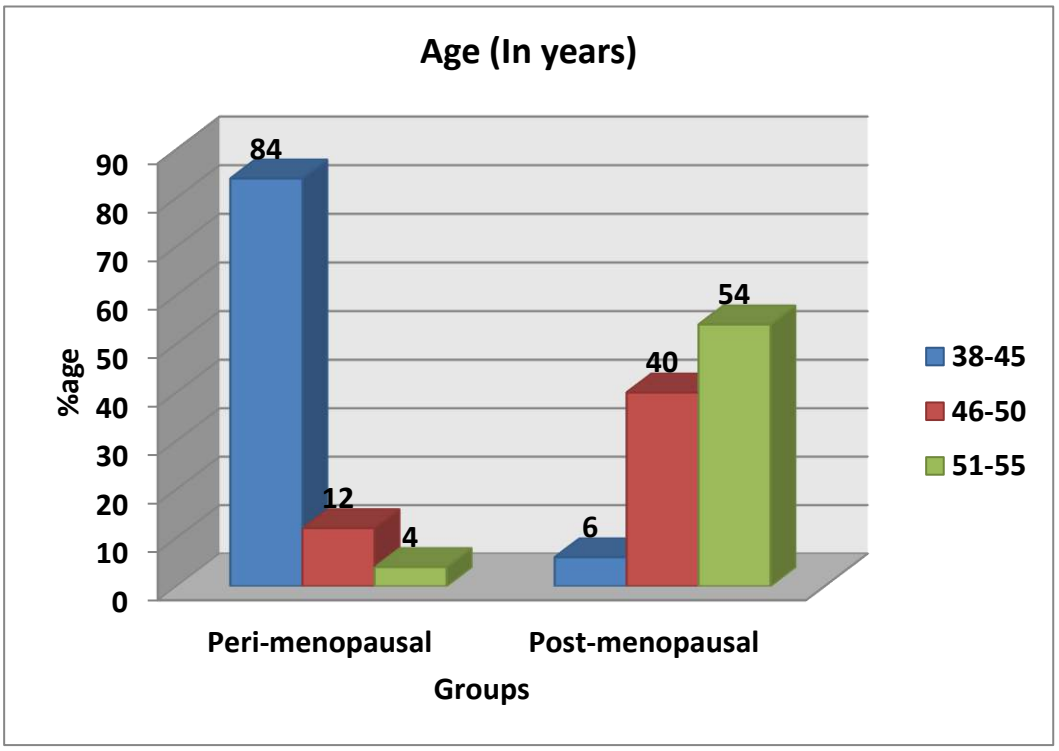


Figure 2: comparative distribution of age (in years) between the groups

Table 3: Comparative distribution of type of residence between the groups

Residence	Group		Total
	Peri-menopausal	Post-menopausal	
Urban	41	39	80
	82.0%	78.0%	80.0%
Rural	9	11	20
	18.0%	22.0%	20.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	0.617 (NS)		

Test applied: chi-square test

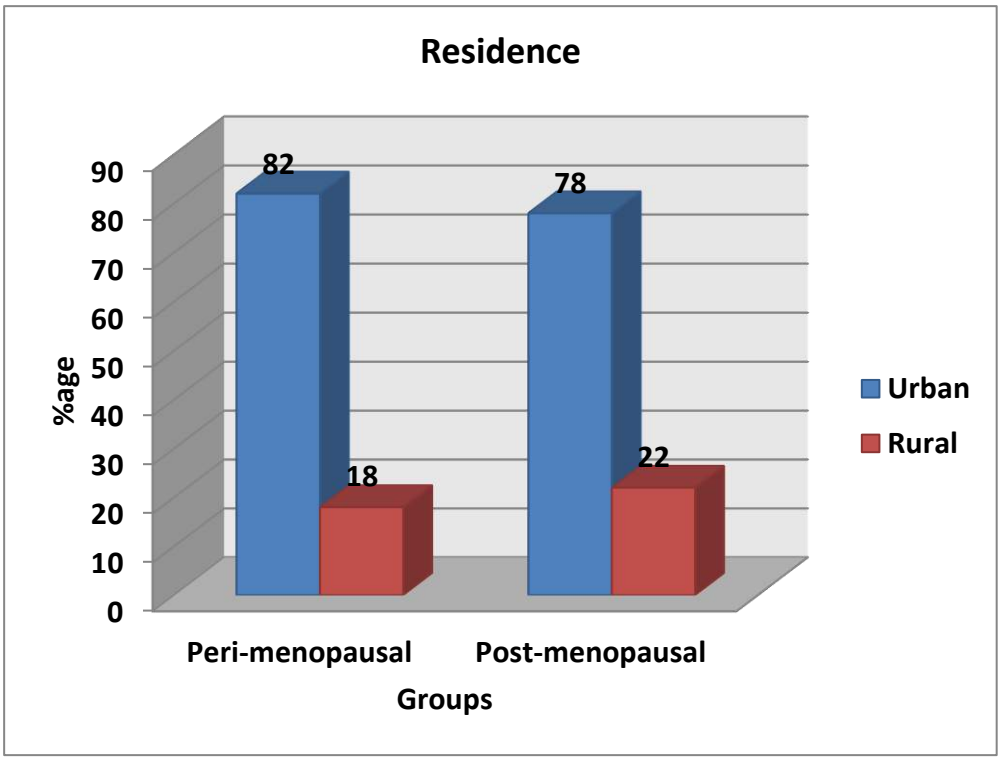


Figure 3: Comparative distribution of type of residence between the groups

Table 4: Comparative distribution of marital status between the groups

Marital status	Group		Total
	Peri-menopausal	Post-menopausal	
Married	49	48	97
	98.0%	96.0%	97.0%
Divorced	0	1	1
	.0%	2.0%	1.0%
Widow	1	1	2
	2.0%	2.0%	2.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	0.603 (NS)		

Test applied: chi-square test

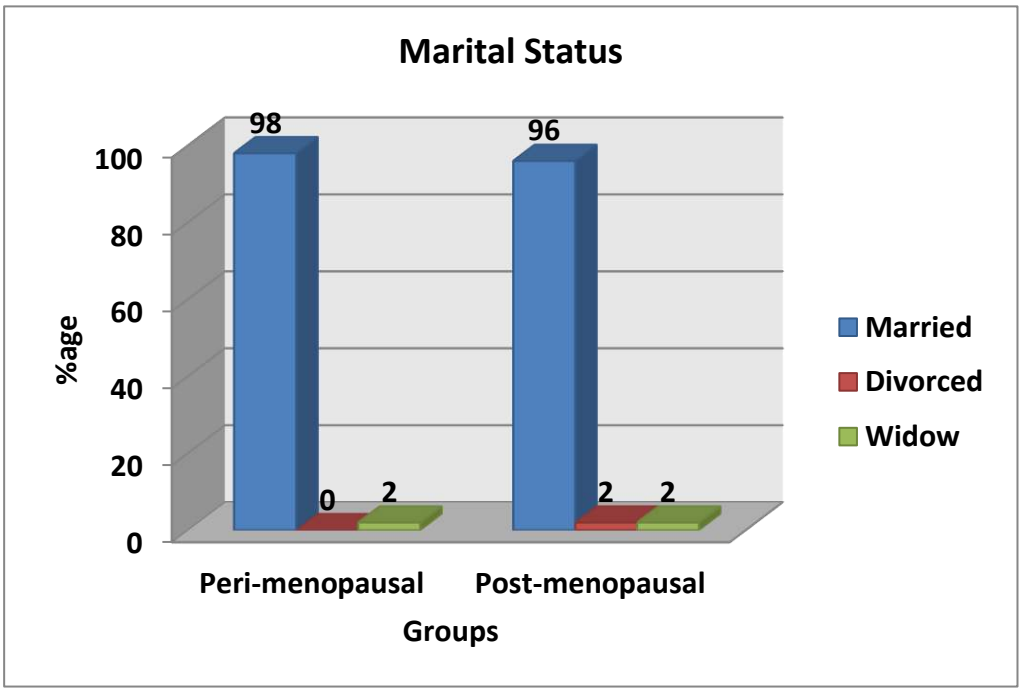


Figure 4: Comparative distribution of marital status between the groups

Table 5: Comparative distribution of level of education between the groups

Education	Group		Total
	Peri-menopausal	Post-menopausal	
Illiterate	7	9	16
	14.0%	18.0%	16.0%
Matriculation	24	29	53
	48.0%	58.0%	53.0%
Higher secondary	6	6	12
	12.0%	12.0%	12.0%
Graduation	12	5	17
	24.0%	10.0%	17.0%
Post Graduation	1	1	2
	2.0%	2.0%	2.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	0.462 (NS)		

Test applied: chi-square test

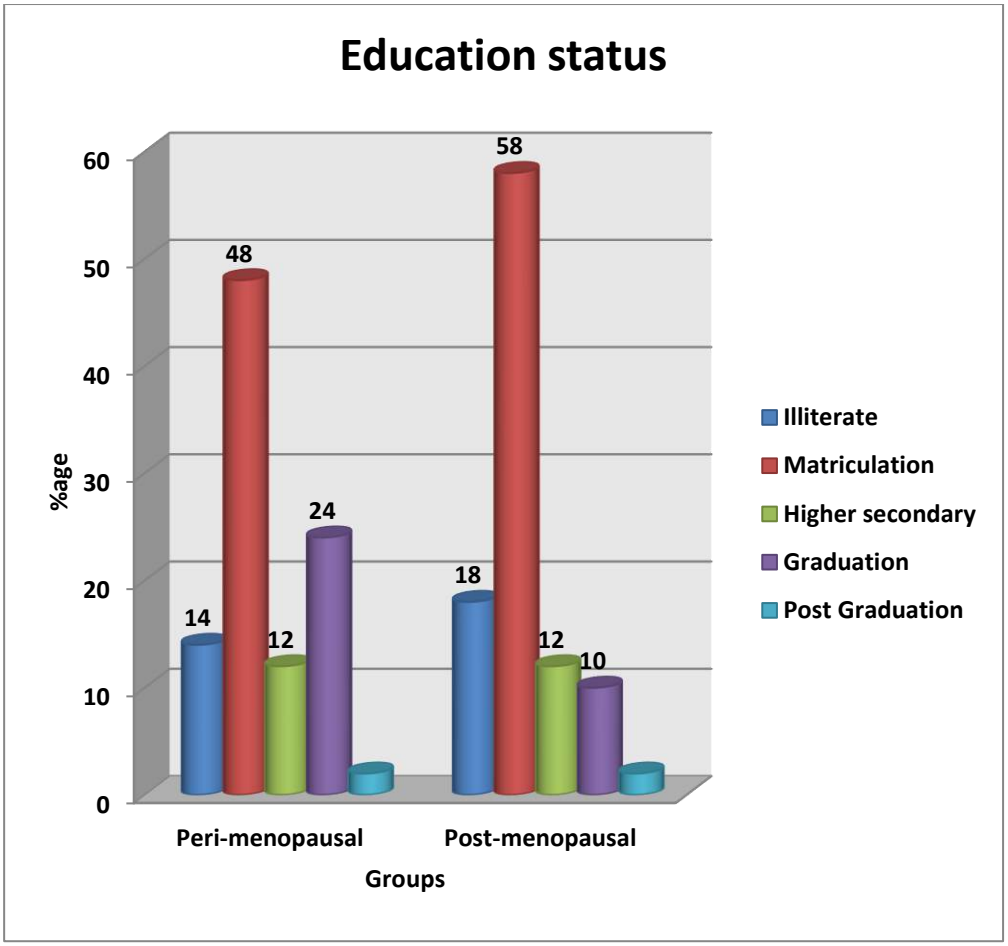


Figure5: Comparative distribution of level of education between the groups

Table 6: Comparative distribution of type of occupation between the groups

Occupation	Group		Total
	Peri-menopausal	Post-menopausal	
Home Maker	41	48	89
	82.0%	96.0%	89.0%
Skilled	9	2	11
	18.0%	4.0%	11.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	0.025 (Sig.)		

Test applied: chi-square test

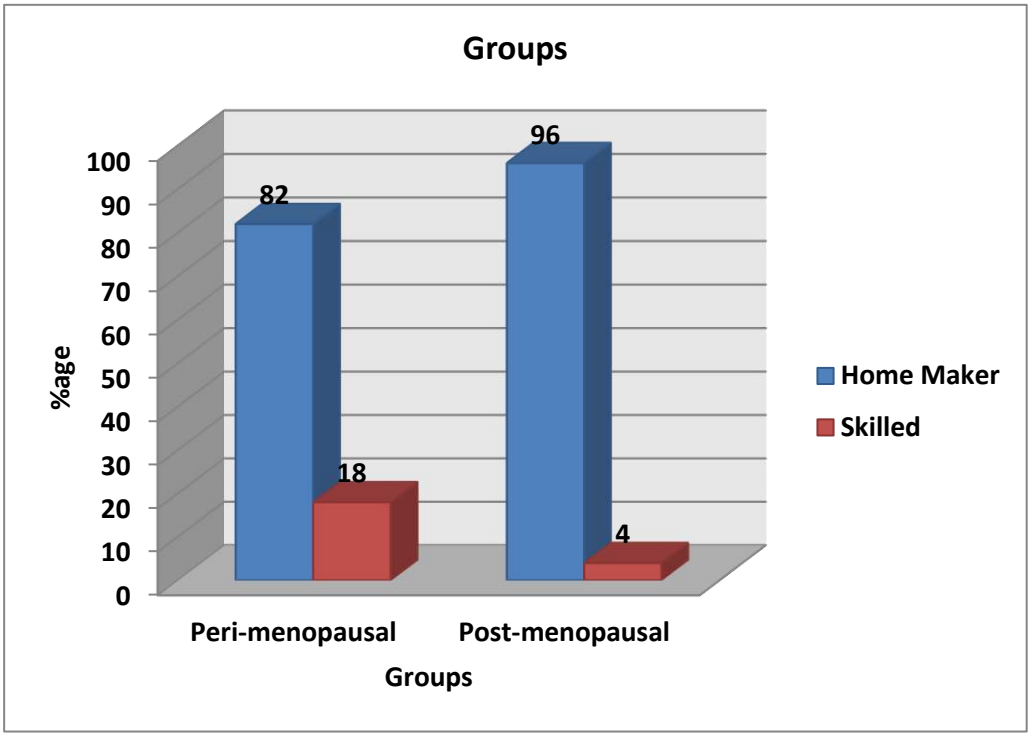


Figure 6: Comparative distribution of type of occupation between the groups

Table 7: Comparative distribution of level of income between the groups

Income (Rupee)	Group		Total
	Peri-menopausal	Post-menopausal	
NA	41	48	89
	82.0%	96.0%	89.0%
10,000-50000	7	0	7
	14.0%	.0%	7.0%
More than 50000 but Less than 1 Lakh	2	1	3
	4.0%	2.0%	3.0%
More than or equal to 1 Lakh	0	1	1
	.0%	2.0%	1.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	0.031 (Sig.)		

Test applied: chi-square test

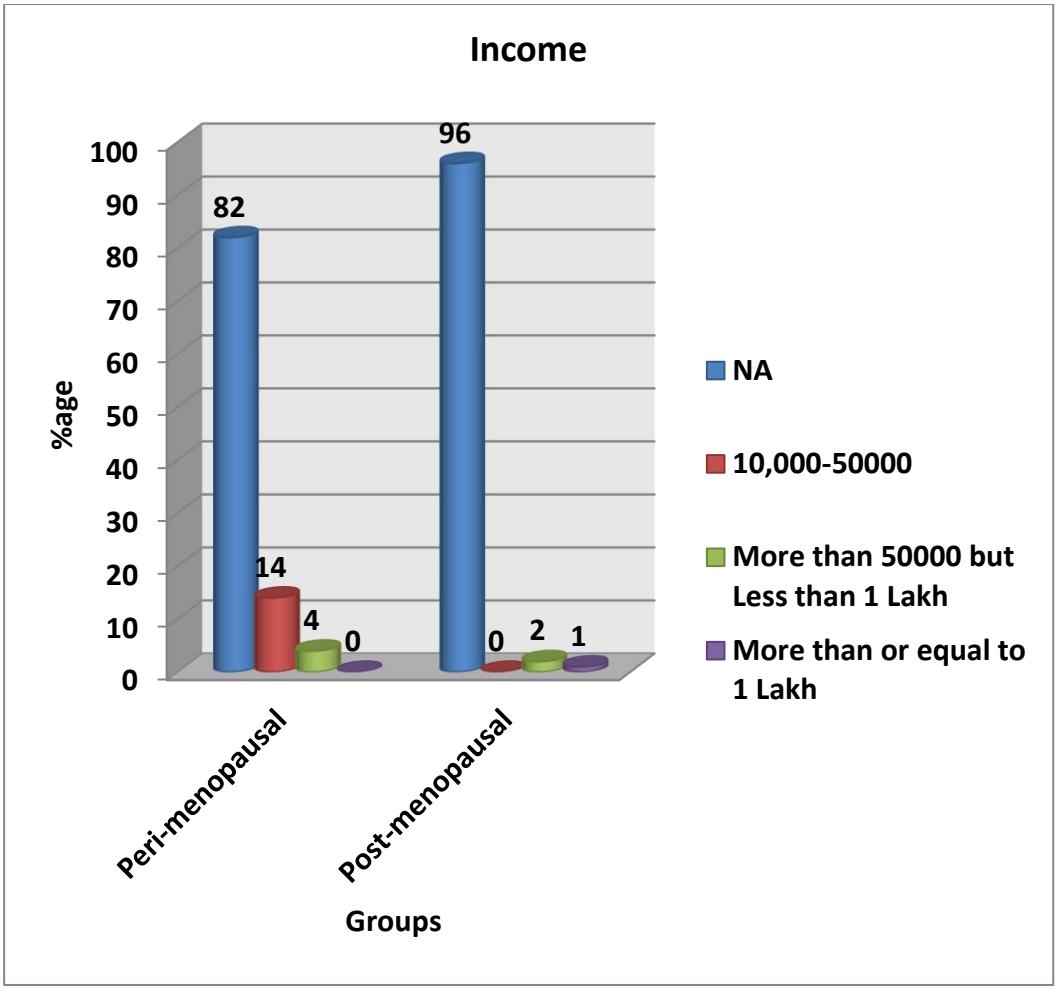


Figure 7: Comparative distribution of level of income between the groups

Table 8: Comparative distribution of type of family between the groups

Family type	Group		Total
	Peri-menopausal	Post-menopausal	
Nuclear	20	24	44
	40.0%	48.0%	44.0%
Joint	30	26	56
	60.0%	52.0%	56.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	0.420 (NS)		

Test applied: chi-square test

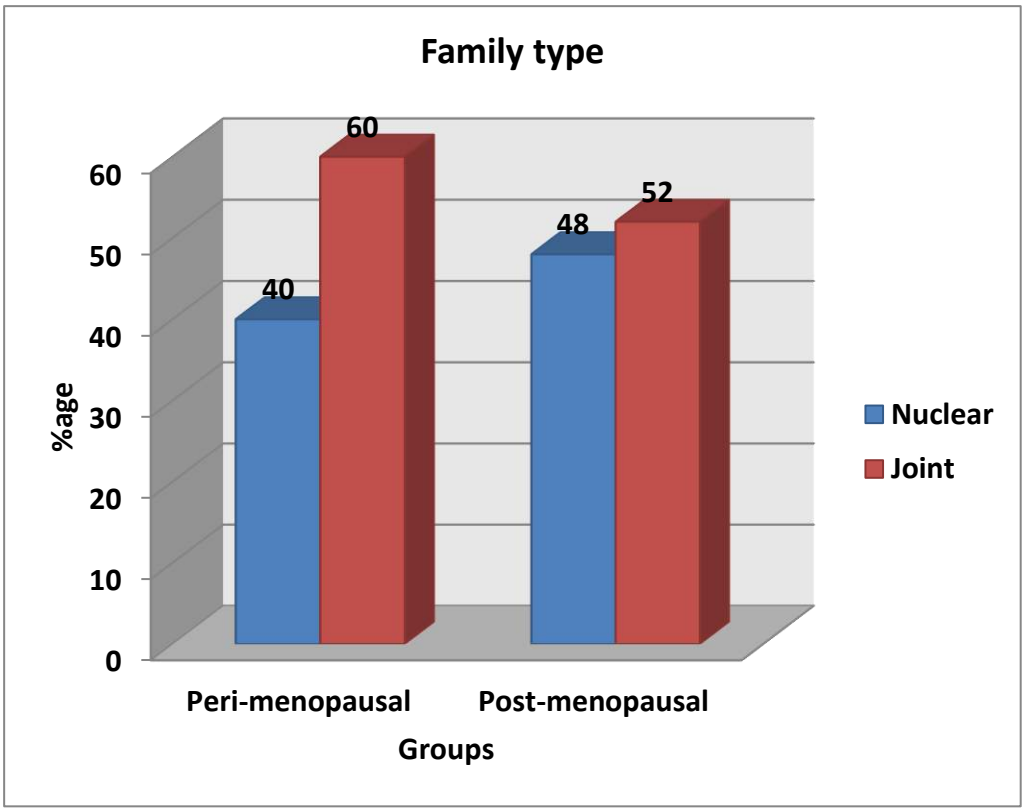


Figure 8: Comparative distribution of type of family between the groups

Table 9: Comparative distribution of systolic and diastolic blood pressure between the groups

Blood Pressure (in millimeter of mercury)`	Group				p-value
	Peri-menopausal		Post-menopausal		
	Mean	Std. Deviation	Mean	Std. Deviation	
Systolic	120.4800	10.60273	121.5600	8.85521	0.582 (NS)
Diastolic	81.2000	6.89276	79.6000	6.04743	0.220 (NS)

Test applied: Independent sample t-test

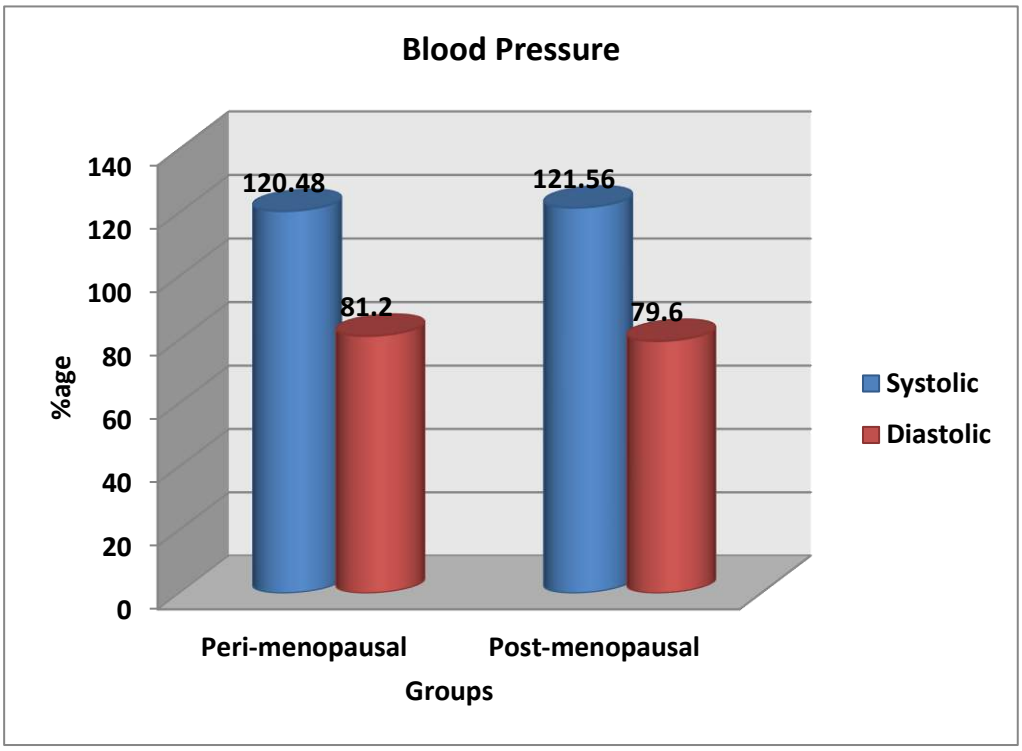


Figure 9: Comparative distribution of systolic and diastolic blood pressure between the groups

Table 10: Comparative distribution of various menstrual variables between the groups

Menstrual variables	Group				p-value
	Peri-Menopausal		Post-Menopausal		
	Mean	Std. Deviation	Mean	Std. Deviation	
Age Of Menarche	12.7200	0.78350	12.7400	0.77749	0.898 (NS)
LMP (Months Back)	3.6000	0.96890	37.0800	21.01976	0.001 (Sig.)
Number Of Days Of Menses	3.8400	1.07590	3.6200	0.94524	0.280 (NS)
Duration Of Menstrual Periods	29.4000	0.92582	29.6000	0.80812	0.253 (NS)

Test applied: Independent sample t-test

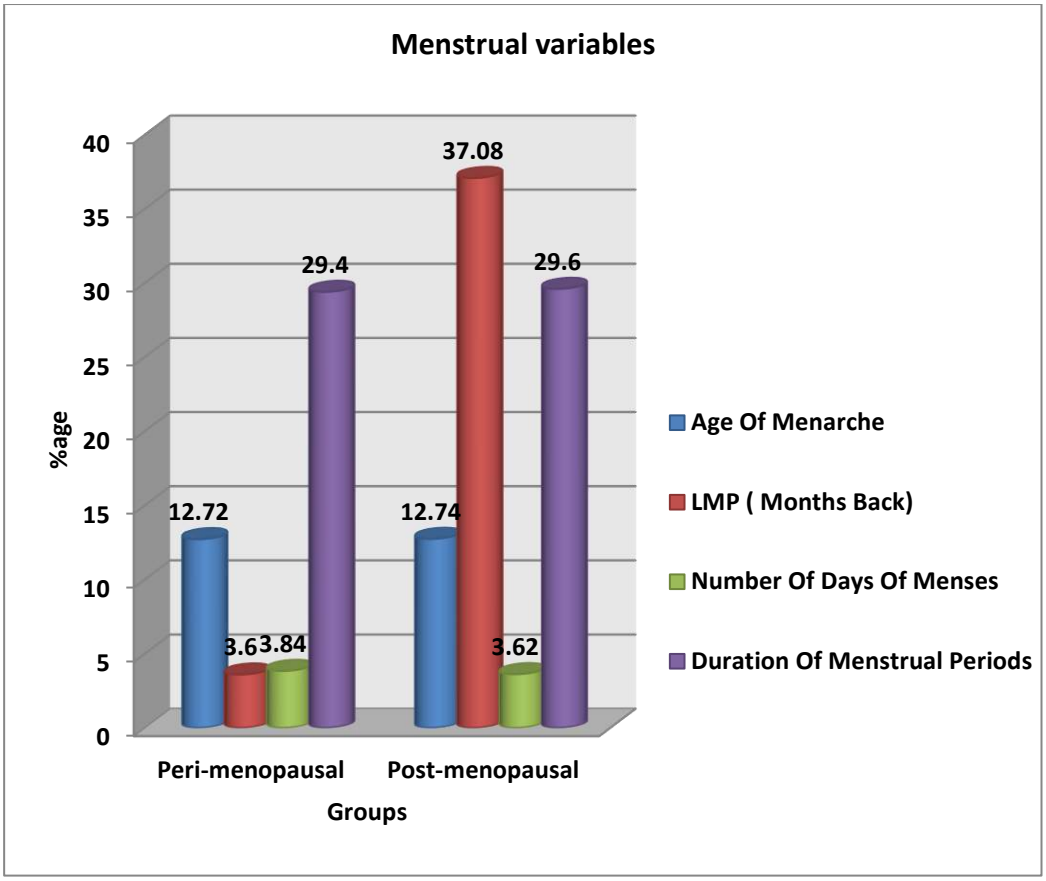


Figure 10: Comparative distribution of various menstrual variables between the groups

Table 11: Comparative distribution of regularity of the menstrual cycle between the groups

Menstrual cycle	Group		Total
	Peri-Menopausal	Post-Menopausal	
Irregular	50	50	100
	100.0%	100.0%	100.0%
Regular	0	0	0
	0.0	0.0	0.0
Total	50	50	100
	100.0%	100.0%	100.0%
p-value	NA		

NA: Not applicable

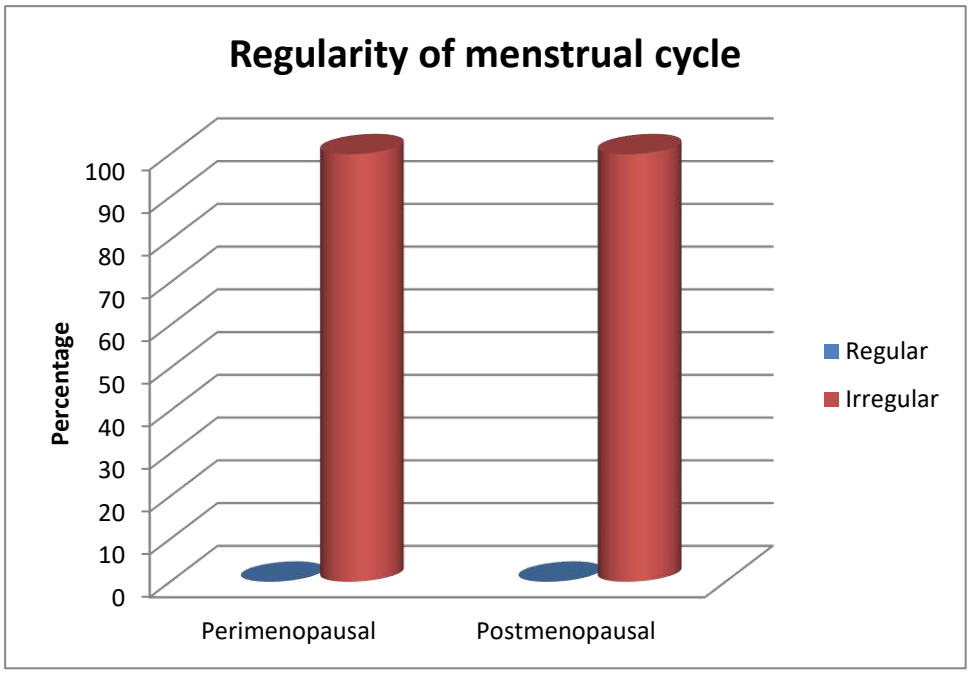


Figure 11: Comparative distribution of regularity of the menstrual cycle between the groups

Table 12: Comparative distribution of various medical illnesses between the groups

Medical Illness		Group		Total
		Peri-Menopausal	Post-Menopausal	
	No illness	40	36	76
		80.0%	72.0%	76.0%
	Diabetes mellitus	6	7	13
		12.0%	14.0%	13.0%
	Hypertension	2	2	4
		4.0%	4.0%	4.0%
	Thyroid illness	2	5	7
		4.0%	10.0%	7.0%
Total		50	50	100
		100.0%	100.0%	100.0%
p-value		0.665 (NS)		

Test applied: chi-square test

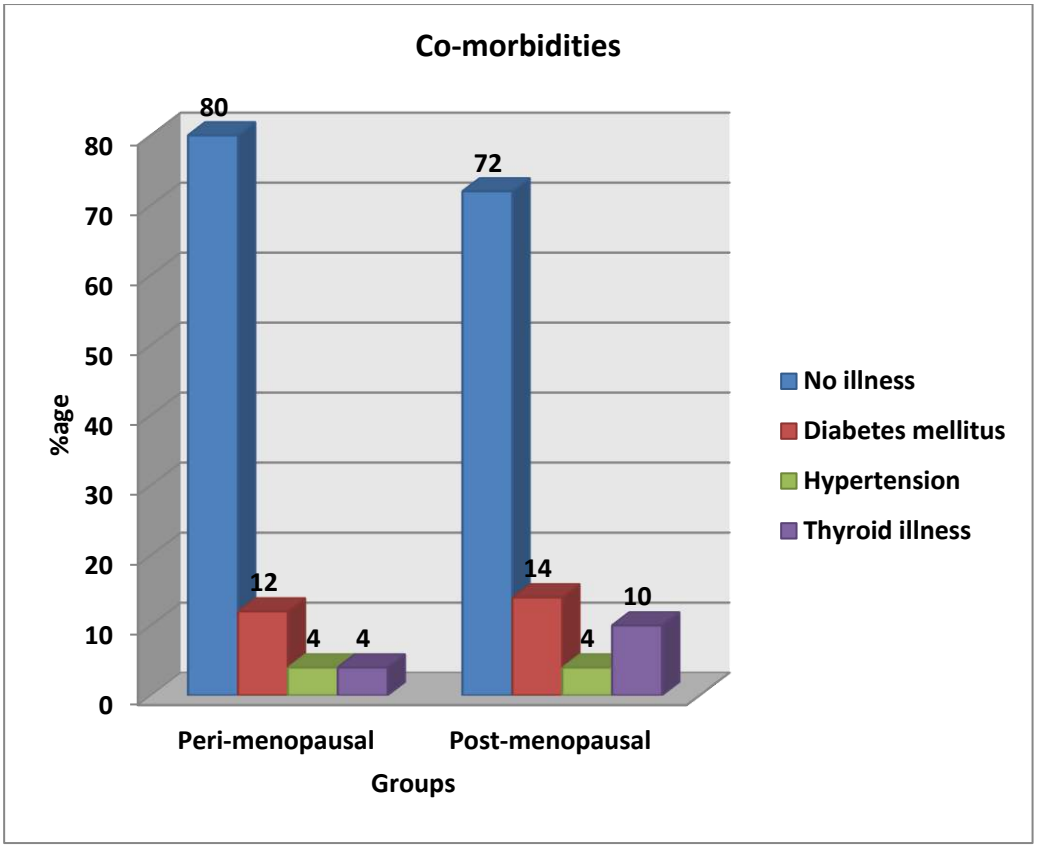


Figure 12: Comparative distribution of various medical illnesses between the groups

Table 13: Comparative distribution of type of diet between the groups

Nutritional assessment		Group		Total
		Peri-Menopausal	Post-Menopausal	
	Vegetarian	41	42	83
		82.0%	84.0%	83.0%
	Non-vegetarian	9	8	17
		18.0%	16.0%	17.0%
Total		50	50	100
		100.0%	100.0%	100.0%
p-value		0.790 (NS)		

Test applied: chi-square test

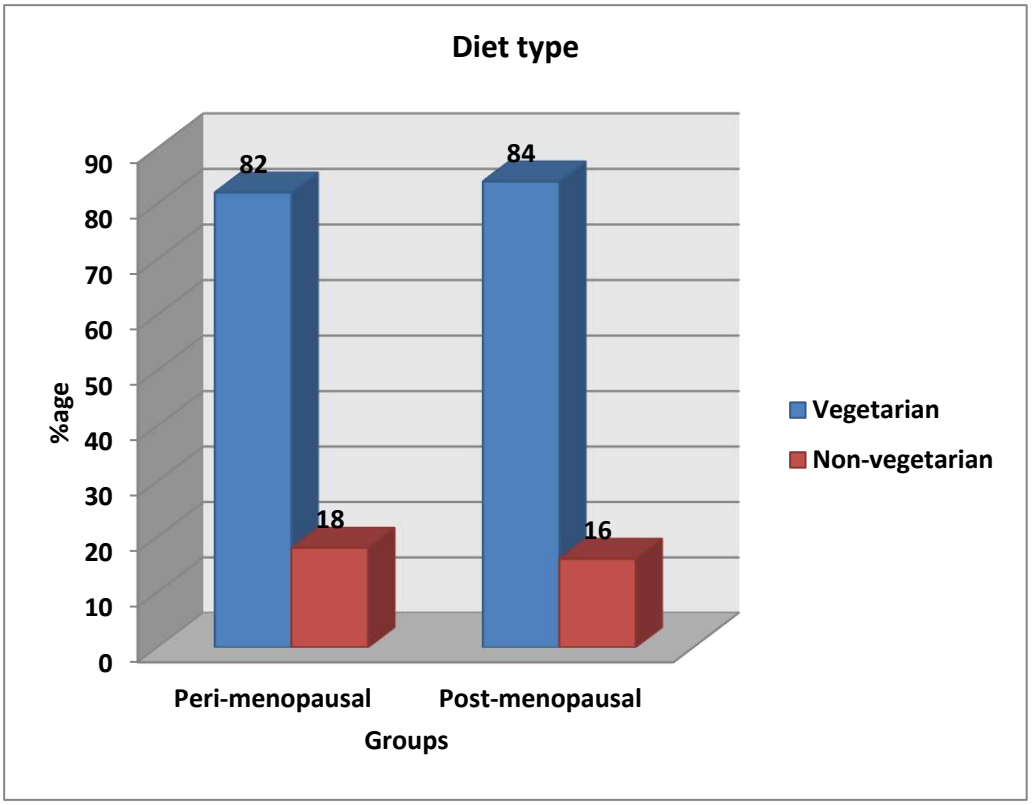


Figure 13: Comparative distribution of type of diet between the groups

Table 14: Comparative distribution of PGI memory scale and its various domains between the groups

PGI Memory Scale	N	Group				P-Value
		Peri-Menopausal		Post-Menopausal		
		Mean	Std. Deviation	Mean	Std. Deviation	
Remote Memory	50	3.3400	1.31878	3.6200	1.52382	0.328 (Ns)
Recent Memory	50	3.0000	0.00000	3.0200	0.14142	0.320 (Ns)
Mental Balance	50	3.1400	1.56505	3.5200	1.52850	0.222 (Ns)
Attention And Concentration	50	2.9600	0.49322	3.3200	0.65278	0.002* (Sig.)
Delayed Recall	50	2.0600	0.42426	3.1000	1.35902	0.001* (Sig.)

Immediate Recall	50	1.0600	0.23990	1.0800	0.56569	0.818 (Ns)
Retention For Similar Pairs	50	2.9600	0.28284	3.0000	0.00000	0.320 (Ns)
Retention For Dissimilar Pairs	50	4.8600	0.63920	4.9000	0.58029	0.744 (Ns)
Visual Retention	50	3.8800	1.15423	3.8000	0.98974	0.711 (Ns)
Recognition	50	2.7200	0.53605	2.9600	0.28284	0.006* (Sig.)
Total Memory Score	50	2.9800	0.89191	3.8800	0.93982	0.001* (Sig.)

Test applied: student t-test

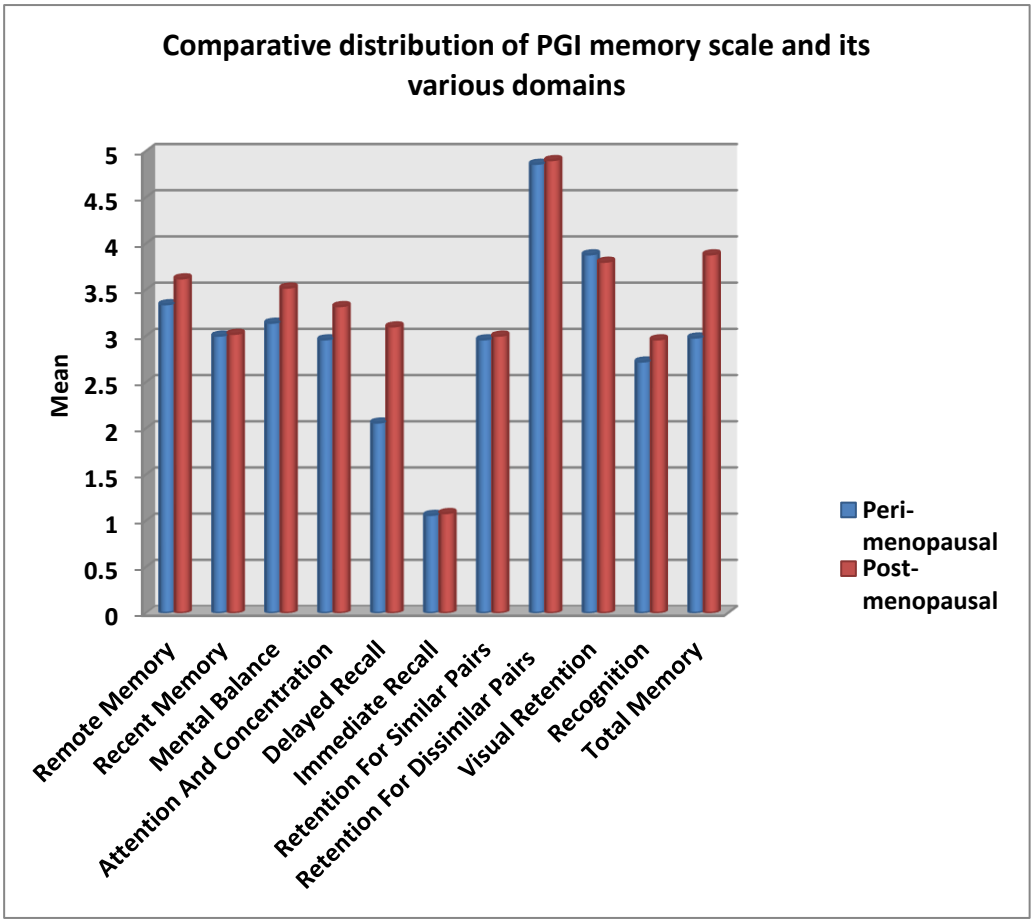


Figure 14: Comparative distribution of PGI memory scale and its various domains between the groups

Table 15: Comparative distribution of total IQCODE and its various domains between the groups

IQCODE	N	Group				p-value
		Peri-Menopausal		Post-Menopausal		
		Mean	Std. Deviation	Mean	Std. Deviation	
Remembering things about family and friends	50	3.0800	0.27405	3.2200	0.41845	0.050* (Sig.)
Remembering things that have happened recently	50	3.1800	0.38809	3.2400	0.43142	0.466 (NS)
Recalling conversations a few days later	50	3.4400	0.50143	3.3800	0.49031	0.547 (NS)
Remembering his/her address and telephone number	50	3.7600	0.43142	3.8400	0.37033	0.322 (NS)

Remembering what day and month it is	50	3.2200	0.41845	3.4800	0.50467	0.006* (Sig.)
Remembering where things are usually kept	50	3.0400	0.19795	3.1200	0.32826	0.143 (NS)
Remembering where to find things which have been put in a different place from usual	50	3.2400	0.43142	3.6600	0.47852	0.001* (Sig.)
Knowing how to work familiar machines around the house	50	3.0200	0.14142	3.0000	0.00000	0.320 (NS)
Learning to use a new gadget or machine around the house	50	3.6800	0.47121	3.8400	0.37033	0.062 (NS)
Learning new things in general	50	3.5200	0.50467	3.7400	0.44309	0.023 * (Sig.)

Following a story in a book or on TV	50	3.0000	0.00000[a]	3.0000	0.00000[a]	-
Making decisions on everyday matters	50	3.0200	0.14142	3.0000	0.00000	0.320 (NS)
Handling money for shopping	50	3.0000	0.00000	3.1600	0.37033	0.003* (Sig.)
Handling financial matters	50	3.2600	0.44309	3.4800	0.50467	0.023* (Sig.)
Handling other everyday arithmetic problems	50	3.5400	0.50346	3.7600	0.43142	0.021* (Sig.)
Using his/her intelligence to understand what's going on and to reason things through	50	3.0800	0.27405	3.1000	0.30305	0.730 (NS)
IQCODE total	50	3.2420	0.09222	3.3426	0.10945	0.001* (Sig.)

Test applied: student t-test

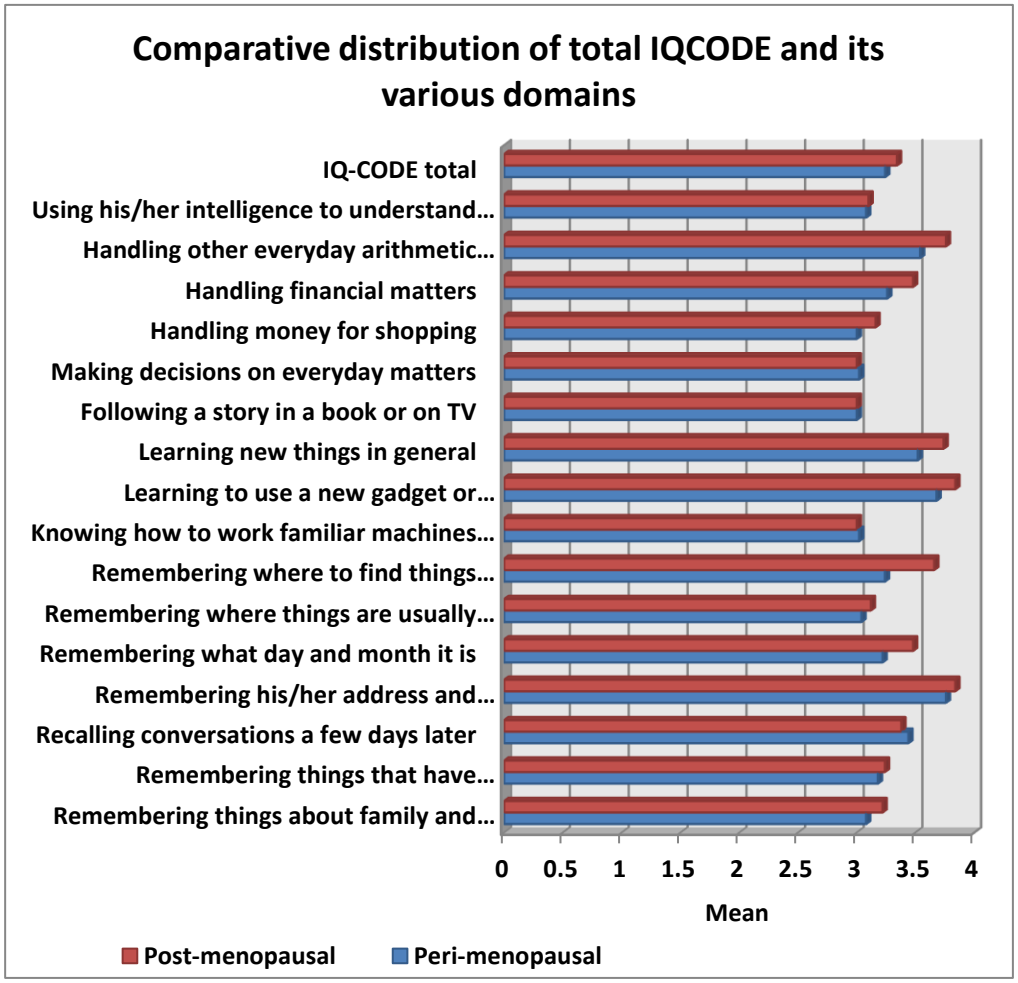


Figure15: Comparative distribution of total IQCODE and its various domains between the groups

Table 16: Comparative distribution of various domains of MMSE scale between the groups

MMSE-domains	N	Group				p-value
		Peri-Menopausal		Post-Menopausal		
		Mean	Std. Deviation	Mean	Std. Deviation	
Orientation	50	9.4200	.53795	9.0000	.45175	0.001 (Sig.)
Registration	50	3.0000	.00000[a]	3.0000	.00000[a]	-
Attention and Concentration	50	3.7600	.71600	3.4400	.50143	0.011 (Sig.)
Recall	50	2.9000	.30305	2.8000	.40406	0.165 (NS)
Language	50	9.0000	.00000[a]	9.0000	.00000[a]	-

Test applied: student t-test

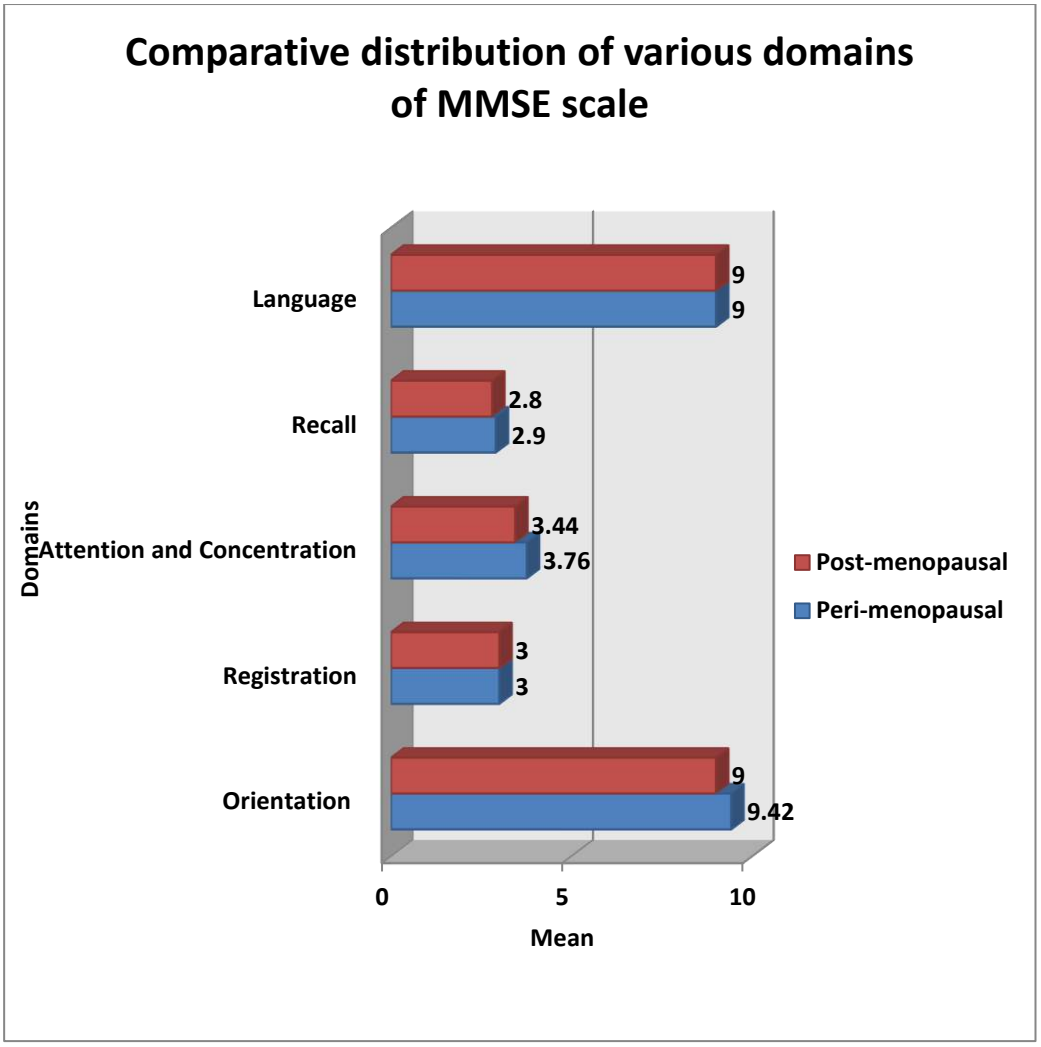


Figure 16: Comparative distribution of various domains of MMSE scale between the groups

Table 17: Correlation of domains of PGI Memory scale with age in Peri-menopausal and Post-menopausal group

PGI Memory scale		Peri-menopausal	Post-menopausal
Remote Memory	Pearson Correlation	0.132	0.048
	Sig. (2-tailed)	0.362	0.740
Recent Memory	Pearson Correlation	.[a]	0.205
	Sig. (2-tailed)	.	0.154
Mental Balance	Pearson Correlation	0.129	-0.051
	Sig. (2-tailed)	0.374	0.723
Attention And Concentration	Pearson Correlation	0.150	0.018

	Sig. (2-tailed)	0.297	0.901
Delayed Recall	Pearson Correlation	**.446****	-0.162
	Sig. (2-tailed)	0.001	0.260
Immediate Recall	Pearson Correlation	-0.189	0.002
	Sig. (2-tailed)	0.188	0.989
Retention For Similar Pairs	Pearson Correlation	**-0.365****	.[a]
	Sig. (2-tailed)	0.009	.
Retention For Dissimilar Pairs	Pearson Correlation	-0.037	0.022
	Sig. (2-tailed)	0.798	0.878
Visual Retention	Pearson Correlation	-0.020	-0.213

	Sig. (2-tailed)	0.888	0.138
Recognition	Pearson Correlation	0.008	-0.053
	Sig. (2-tailed)	0.958	0.716
Total Memory Score	Pearson Correlation	0.135	0.044
	Sig. (2-tailed)	0.351	0.762

**** Statistically significant**

Table 18: Correlation of total IQCODE and its various domains with age in Peri-menopausal and Post-menopausal group

IQCODE		Peri-menopausal	Post-menopausal
Remembering things about family and friends	Pearson Correlation	.106	.025
	Sig. (2-tailed)	.463	.865
Remembering things that have happened recently	Pearson Correlation	-.027	-.175
	Sig. (2-tailed)	.853	.225
Recalling conversations a few days later	Pearson Correlation	.210	-.018
	Sig. (2-tailed)	.142	.901
Remembering his/her address and telephone number	Pearson Correlation	-.003	-.122
	Sig. (2-tailed)	.982	.398
Remembering what day and month it is	Pearson Correlation	-.065	.028
	Sig. (2-tailed)	.652	.848
Remembering where things are usually kept	Pearson Correlation	-.028	.093
	Sig. (2-tailed)	.848	.523

Remembering where to find things which have been put in a different place from usual	Pearson Correlation	.136	.304
	Sig. (2-tailed)	.347	.062
Knowing how to work familiar machines around the house	Pearson Correlation	.041	.[a]
	Sig. (2-tailed)	.776	.
Learning to use a new gadget or machine around the house	Pearson Correlation	.215	-.026
	Sig. (2-tailed)	.134	.860
Learning new things in general	Pearson Correlation	.074	.040
	Sig. (2-tailed)	.610	.782
Following a story in a book or on TV	Pearson Correlation	.[a]	.[a]
	Sig. (2-tailed)	.	.
Making decisions on everyday matters	Pearson Correlation	-.161	.[a]
	Sig. (2-tailed)	.264	.
Handling money for shopping	Pearson Correlation	.[a]	-.265
	Sig. (2-tailed)	.	.063
Handling financial matters	Pearson Correlation	.068	.099

	Sig. (2-tailed)	.639	.495
Handling other everyday arithmetic problems	Pearson Correlation	.029	-.141
	Sig. (2-tailed)	.842	.330
Using his/her intelligence to understand what's going on and to reason things through	Pearson Correlation	-.019	.076
	Sig. (2-tailed)	.895	.602
IQCODE total	Pearson Correlation	.112	.051
	Sig. (2-tailed)	.441	.723

Table 19: Correlation of MMSE-domains with age in Peri-menopausal and Post-menopausal group

MMSE-domains		Peri-menopausal	Post-menopausal
Orientation	Pearson Correlation	-.081	.111
	Sig. (2-tailed)	.578	.443
Registration	Pearson Correlation	.[a]	.[a]
	Sig. (2-tailed)	.	.
Attention and Concentration	Pearson Correlation	.086	-.102
	Sig. (2-tailed)	.553	.482
Recall	Pearson Correlation	-.077	-.096
	Sig. (2-tailed)	.593	.509
Language	Pearson Correlation	.[a]	.[a]
	Sig. (2-tailed)	.	.

RESULTS

The study was conducted on the 50 perimenopausal and 50 postmenopausal females in the age group of 38-55 years presenting to Department of Psychiatry and Obs and Gyane, DMC&H Ludhiana. Subjects were further assessed using MMSE, PGI memory scale and IQCODE Scale. The data, thus, collected was tabulated and after analysing, the following results wereobtained.

TABLE 1 and FIGURE 1 shows mean age of perimenopause and postmenopause is 42.9800 years and 50.9600 years respectively. Other anthropometric measurements on statistical analysis between the Peri-menopausal and Post-menopausal group as; weight (64.0600 and 67.1000; p=0.129), height (160.7200 and 161.3400; p=0.064) and BMI (25.0328 and 26.1844; p=0.141).

TABLE 2 and FIGURE 2 shows that in perimenopausal group, majority 84% of the women were observed in the age group of 38-45 years followed by 12% in 46-50 years and 4% in 51-55 years. In postmenopausal group majority 54% of the women were observed in the age group of 51-55 years followed by 40% women in 46-50 years and rest 6% women in 38-45 years of age group. On chi-square analysis the difference in the distribution between the groups was found statistically significant (p=0.001)

TABLE 3 and FIGURE 3 shows that in both the groups' majority of the patients were found residing in urban area (82% in peri- menopausal group and 78% in post-menopausal group). On chi-square analysis the no significant difference was observed (p=0.617)

TABLE 4 and FIGURE 4 shows that in both the groups' majority of the patients were found married (98% in peri- menopausal group and 96% in post-menopausal group). Only 1 patient in post-menopausal group is divorced. 1 patient each in both the groups has lost their husband. On chi-square analysis the no significant difference was observed (p=0.603).

TABLE 5 and FIGURE 5 shows that in both the groups' majority of the patients had passed matriculation (48% in peri- menopausal group and 58% in post-menopausal group). On chi-square analysis no significant difference was observed (p=0.462).

TABLE 6 and FIGURE 6 shows In both the groups' majority of the patients was home maker (82% in peri-menopausal group and 96% in post-menopausal group). Whereas 18% were skilled in peri-menopausal group and only 4% were found skilled in post-menopausal group. On chi-square analysis significant difference was observed (p=0.025).

TABLE 7 and FIGURE 7 shows that majority of the patients in both the groups were not earning i.e. 82% in peri-menopausal group and 96% in post menopausal group. Only two patients in post-menopausal group were found earning whereas in peri-menopausal group 9 patients were found earning. On chi-square analysis significant difference was observed (p=0.031).

TABLE 8 and FIGURE 8 shows that in both groups 56% were found living in joint family setup and 44% were found living in nuclear family setting (p=0.420).

TABLE 9 and FIGURE 9 shows that mean systolic diastolic blood pressure in peri-menopausal group was 120.4800 mmHg and 81.2000 mmHg (p=0.582). In post-menopausal group systolic and diastolic blood pressure was 121.5600 mmHg and 79.6000 mmHg (p=0.220).

TABLE 10 and FIGURE 10 shows that in peri and post-menopausal group, the mean age of menarche (12.7200 and 12.7400), mean LMP (3.6000 and 37.0800), mean number of days of menses (3.8400 and 3.6200) and mean duration of menstrual periods (29.4000 and 29.6000).

TABLE 11 and FIGURE 11 shows that menstrual cycle in both the groups was found Irregular. No regularity in menstrual cycle was seen

in any of the patient.

TABLE 12 and FIGURE 12 shows that in peri-menopausal group, 12% were diabetic, 4% hypertensive and 4% showed thyroid disorder. In Post-menopausal group, diabetes was observed in 14% of the patients, 4% hypertensive and 4% showed thyroid disorder (p=0.665).

TABLE 13 and FIGURE 13 shows that majority of the patients in both the groups followed vegetarian diet i.e. 82% in peri and 84% in post-menopausal group. 18% in peri and 16% in post-menopausal group were non-vegetarians.

TABLE 14 and FIGURE 14 shows that while comparing the PGI memory scale and its domains between the groups; few of the domains were found varied significantly like Attention & Concentration (p=0.002), Delayed Recall (p=0.001) and Recognition (p=0.006). Overall, significantly lower mean value of total memory score was observed in post-menopausal than peri-menopausal women (p=0.001).

TABLE 15 and FIGURE 15 shows that while comparing the total IQCODE and its various domains between the groups; few of the domains were found varied significantly like Remembering things about family and friends (p=0.050), Remembering what day and month it is (p=0.006), Remembering where to find things which have been put in a different place from usual (p=0.001), Learning new things in general (p=0.023), Handling money for shopping (p=0.003), Handling financial matters (p=0.023%), Handling other everyday arithmetic problems (p=0.021). Overall, significantly higher mean value of total IQ-CODE was observed in post-menopausal than peri-menopausal women (p=0.001).

TABLE 16 and FIGURE 16 shows that while comparing the MMSE domains between the groups; few of the domains were found varied significantly like Orientation (p=0.001) and Attention & Concentration (p=0.011).

TABLE 17 shows that while analyzing the domains of PGI memory scale, only two domains i.e. delayed recall and retention for similar pairs showed significant correlation with the age in peri-menopausal group. No correlation exists in post-menopausal group between memory scale and its domains with age.

TABLE 18 shows IQCODE and its domains in both the groups showed no statistically significant correlation with age.

TABLE 19 shows that MMSE-domains in both the groups showed no statistically significant correlation with age.

DISCUSSION

Menopausal transition or climacteric phase is the phase in the aging of women, marking the transition from the reproductive phase to the non-reproductive state. Cognitive decline is a frequent complaint during this phase. Changes in memory correspond with diminished estrogen production. Cognitive disorders in the form of memory and attention disorders are complaints that are often made by women who experience a menopause transition. About 60% of menopausal women report memory disorders[43]. This study was conducted on 50 perimenopausal and 50 postmenopausal females aimed to study neurocognitive impairment in both the groups.

In the present study, the mean age of perimenopause and postmenopause is 42.98 years and 50.96 years. The variation between age for these two groups is also observed further as in perimenopausal group, 84% (majority)of the women were observed in the age group of 38-45 years followed by 12% in 46-50 years and 4% in 51-55 years and in postmenopausal group, 54% (majority) of the women were observed in the age group of 51-55 years followed by 40% women in 46-50 years and rest 6% women in 38-45 years of age group. In another study conducted by Seul Koo et al.[46] **,** the authors observed the mean age of women in perimenopause and postmenopause was 48.6 ± 2.8 and 52.0 ± 3.1 years old, respectively.Pandey S et al[47] (2020) reported majority of the respondents were at age group 40-44 years (36.4%) tailed by 33.5% of age group 45-49 years where the mean age was 46 years . This result was in accordance with previous studies conducted.[48,49]

In the present study ,56% were found living in joint family and 44% were found living in nuclear family setting. Similarly Pandey S et al[47] reported in their study majority of the respondents belonged to the joint family (52.6 %). In present study, p value of 0.420 (non significant) signifies that patients were randomly distributed between the two

groups on comparative distribution of type of family.

In our study ,16% were found illiterate and rest 84% found educated and majority of them were homemaker and not earning. This result was in accordance with previous studies conducted[47-50]. In the present study, the comparative distribution of level of education between the two groups, shows p value of 0.462 which is non significant. It shows that both the groups were comparable and no biostatistically significant difference was observed among both the groups in terms of level of education.

In our study the mean age of menarche in years; (Peri-12.72 and Post-12.74), mean LMP in months; (Peri-3.60 and Post-37.08), mean number of days of menses; (Peri-3.84 and Post-3.62) and mean duration of menstrual periods in days; (Peri-29.4000 and Post-29.6000). Similar findings also observed in previous studies. [48,49]

In the present study, BMI was calculated by dividing the weight (in kilograms) by the height (in meters) squared. The study population was classified into three BMI groups on the basis of World Health Organization (WHO) Asian BMI criteria: normal (BMI = 18.5–22.9 kg/m2), overweight (BMI = 23–24.9 kg/m2), and obese (BMI ≥ 25 kg/m2). All women in both the groups were found obese. As majority of females in our study were housewife following sedentary life style and have reduced physical activity which is one of reason that women in both groups were found obese.This was found in agreement with findings of the study conducted by Koo S et al[46] (2017) in which both perimenopausal and postmenopausal groups showed higher frequency of obese women and they had significantly higher levels of triglycerides and fasting blood glucose and lower HDL-cholesterol levels than normal women. Poehlman et al[50] (1995) prospectively compared women who became postmenopausal to age-matched controls who remained premenopausal and found that the transition to menopause was associated with an increase in the waist to hip ratio and total body fat.

In our study while comparing the PGI memory scale and its domains between perimenopausal and postmenopausal groups; few of the domains were found varied significantly like Attention & Concentration (p=0.002), Delayed Recall (p=0.001) and Recognition (p=0.006). Overall, significantly lower mean value of total memory score was observed in post-menopausal than peri-menopausal women. This finding was explained by results from multiple large-scale survey studies indicating that peri- and post-menopausal women report a significantly greater number of memory problems than perimenopausal women. For example, Mitchell and Woods[52] reported that 62% of the women in the Seattle Midlife Women's Health Study (SMWHS, n = 230, mean age = 46.7 years) reported noticeable declines in cognitive performance following menopause. The most common complaints were difficulty recalling words or numbers, needing memory aids, and forgetting why one was involved in a certain behavior. The results are being supported by the fact that hippocampus and PFC, which are targets for effects of estrogen (dysregulated during menopausal transition and menopause), plays role in memory processing, working memory and memory encoding and storage. As estrogen supports the formation of dendritic spines and synapse that enhance long term potentiation in hippocampal region.

Similarly, in a survey study conducted by Jim R. Sliwinski et al.[53] which was designed to assess attitudes toward menopause in a sample of 88 post-menopausal Italian women, results indicated that 70% of participants reported deficits in memory. It was proposed that peri-and post-menopausal women express dissatisfaction with their cognitive abilities more frequently than do premenopausal women. It was hypothesized that impairments in cognitive performance is not solely due to declines in circulating estrogen but other factors such as diminished sleep quality, depression, and the onset of hotflashes also contribute and have impact on psychological performance during

menopausal transiton.

In an additional study conducted by Gayatri Devi et al.[54] , sample of 151 female faculty members between the ages of 30 and 60 years who worked for a large New York school district were randomly selected. Results of their study indicate that peri- and post-menopausal women were over three times more likely to report memory complaints than were premenopausal women. There study proposed that menopausal years coincide with loss of hippocampal neurons at the rate of ~5% per decade beginning at 45 years of age. It was concluded that declining estrogen levels at this time may in some way increase the vulnerability of hippocampal neurons to toxicity and cell death, ultimately leading to clinical symptoms of cognitive loss.

In our study, Attention and concentarion, one of few domains of PGI memory scale, showed significant (p=0.002) difference between postmenopausal and perimenopausal females. This was in accordance with study conducted by Schaafsma et al.[55] . In this study, cognitive performance and memory complaints were assessed in a sample of 120 Australian women between the ages of 45 and 60 years. Eighty-two percent of the women in the sample reported memory complaints, and peri-and post-menopausal women were significantly more likely to report memory complaints than were premenopausal women. Multivariate analysis indicated that subjective memory complaints were significantly associated with impairments in attention, reaction time, and verbal memory. When examined collectively, these results suggest that declines in cognitive ability result from hormonal changes occurring during menopause. Other possible mechanism underlying the complaints of memory and attentional clarity is a decline in attentional processing ability during menopausal transition.

Unlike another study conducted by Anne E. Unkenstein et al[56] ,in which comprehensive neuropsychological assessment was carried out in 130 women; aged 40 to 60 years which were recruited from outpatient Menopause and Gynaecological clinics at the Royal

Women's Hospital, Melbourne. Results revealed no difference between premenopausal (n=36), perimenopausal (n=54), and postmenopausal (n=40) groups in performance on memory and executive tasks. Perimenopausal women, however, reported significantly more frequent forgetting (η=0.09, P < 0.01) and less contentment with their memory (η=0.08, P < 0.01) than pre- and postmenopausal women[56].

Our results showed no significant difference between postmenopausal and perimenopausal females as regards to other domains of PGI memory scale like remote memory, recent memory immediate recall. This was in accordance with study conducted by Drachman[59] , who mentioned that performance on immediate or primary memory tasks that do not require storage and retrieval of material such as digit span task and memory for remote past events appear to be relatively intact or not affected during menopausal transition period.

While comparing the total IQCODE and its various domains between the groups; few of the domains were found varied significantly like remembering things about family and friends (p=0.050), remembering what day and month it is (p=0.006), remembering where to find things which have been put in a different place from usual (p=0.001), learning new things in general (p=0.023), Handling money for shopping (p=0.003), handling financial matters (p=0.023 %), handling other everyday arithmetic problems (p=0.021). Overall, significantly higher mean value of total IQ-CODE was observed in post-menopausal than peri-menopausal women (p=0.001). No previous studies have examined this relationship between IQCODE and perimenopausal and postmenopausal women specifically.

While comparing the MMSE domains between the groups; few of the domains were found varied significantly like Orientation (p=0.001) and Attention & Concentration (p=0.011). This was found in agreement with study conducted by Kaur M[57] (2021) among 404 women aged between 40 and 65 years from rural areas of Punjab (North India). The Mini-Mental State Examination (Hindi version) was used to evaluate

orientation, registration, attention, recall, language and visual spatial skills domains of the global cognitive functioning of all participants.

In our study, while analyzing correlation between the domains of PGI memory scale and age, only two domains i.e. delayed recall and retention for similar pairs showed significant correlation with the age in perimenopausal group. No correlation exists in post-menopausal group between PGI memory scale and its domains with age. Similarly, IQCODE and MMSE domains in both the groups showed no statistically significant correlation with age. The study findings require replication within larger samples and thus making it difficult to establish causal relationship between variables.

Some studies provided estrogen assistance in the form of estrogen / hormonal therapy to improve the domain of executive functioning and attention. Low estrogen levels after menopause increase the process of decreasing cognitive abilities that can support memory abilities, attention concentration, and speed in producing information[58].

LIMITATIONS

- This study was limited to one hospital setting.
- Owing to the small sample size, this study may not be entirely reflective of a broader population of perimenopausal and postmenopausal women.
- Depression, Anxiety and other psychological variables were not assessed in our study which could have confounded the results.
- Within limited framework, we can’t do investigations like serum estradiol levels and serum FSH levels and interventions like hormonal replacement therapy.

SUMMARY AND CONCLUSION

The present study was conducted to study the neurocognitive impairment in perimenopausal and postmenopausal females. In our studywe noted the following points: -

- Mean age of perimenopause and postmenopause is 42.9800 years and 50.9600 years respectively
- In perimenopausal group, majority 84% of the women were observed in the age group of 38-45 years followed by 12% in 46-50 years and 4% in 51-55 years.
- In postmenopausal group majority 54% of the women were observed in the age group of 51-55 years followed by 40% women in 46-50 years and rest 6% women in 38-45 years of age group.
- Majority of the patients were found residing in urban area (82% in perimenopausal group and 78% in postmenopausal group).
- Other anthropometric measurements on statistical analysis between the Perimenopausal and Postmenopausal group as; weight (64.0600 and 67.1000; p=0.129), height (160.7200 and 161.3400; p=0.064) and BMI (25.0328 and 26.1844; p=0.141).
- Majority of the patients were found married (98% in peri-menopausal group and 96% in postmenopausal group). Only 1 patient in post-menopausal group is divorced. 1 patient each in both the groups has lost their husband.
- In both the groups' majority of the patients had passed matriculation (48% in perimenopausal group and 58% in post-menopausal group).
- In both the groups' majority of the patients was home maker (82% in perimenopausal group and 96% in postmenopausal group). Whereas 18% were skilled in peri-menopausal group and only 4% were found skilled in postmenopausal group**.**
- Majority of the patients in both the groups were not earning i.e. 82% in perimenopausal group and 96% in post menopausal group. Only two patients in postmenopausal group were found

earning whereas in peri-menopausal group 9 patients were found earning.

- In both groups 56% were found living in joint family setup and 44% were found living in nuclear family setting (p=0.420) .
- In peri and post-menopausal group the mean age of menarche (12.7200 and 12.7400), mean LMP (3.6000 and 37.0800), mean number of days of menses (3.8400 and 3.6200) and mean duration of menstrual periods (29.4000 and 29.6000).
- Menstrual cycle in both the groups was found Irregular. No regularity in menstrual cycle was seen in any of the patient.
- In peri-menopausal group 12% were diabetic, 4% hypertensive and 4% showed thyroid disorder. Post-menopausal group diabetes was observed in 14% of the patients, 4% hypertensive and 4% showed thyroid disorder (p=0.665).
- On analysis it was observed that majority of the patients in both the groups followed vegetarian diet i.e. 82% in peri and 84% in post-menopausal group. 18% in peri and 16% in post-menopausal group were non-vegetarians.
- While comparing the PGI memory scale and its domains between the groups; few of the domains were found varied significantly like Attention & Concentration (p=0.002), Delayed Recall (p=0.001) and Recognition (p=0.006). Overall, significantly lower mean value of total memory score was observed in post-menopausal than peri-menopausal women (p=0.001).
- While comparing the total IQCODE and its various domains between the groups; few of the domains were found varied significantly like Remembering things about family and friends (p=0.050), Remembering what day and month it is (p=0.006), Remembering where to find things which have been put in a different place from usual (p=0.001), Learning new things in general (p=0.023), Handling money for shopping (p=0.003), Handling financial matters (p=0.023 %), Handling other everyday arithmetic problems (p=0.021). Overall, significantly

higher mean value of total IQ-CODE was observed in post-menopausal than peri-menopausal women (p=0.001).

- While comparing the MMSE domains between the groups; few of the domains were found varied significantly like Orientation (p=0.001) and Attention & Concentration (p=0.011).
- While analyzing the domains of PGI memory scale, only two domains i.e. delayed recall and retention for similar pairs showed significant correlation with the age in peri-menopausal group. No correlation exists in post-menopausal group between memory scale and its domains with age
- IQCODE and its domains in both the groups showed no statistically significant correlation with age.
- MMSE-domains in both the groups showed no statistically significant correlation with age.

FUTURE DIRECTIONS

Within the limitation the present study, we concluded that Memory, attention, and cognitive dysfunction are a psychopathological condition. The result of this study will be worthwhile to justify menopause-related memory decline and cognitive dysfunctions. In this study, we had a smaller number of samples and therefore proposing more investigation with a higher number of populations. Dietary supplements or developing a new drug that targets the estrogen receptor in the brain might be a way of treating memory decline and cognitive dysfunctions and decrease the suffering of women after menopause.

The results of this study will also be able to draw interest in the scientific community for research on this specific topic further to develop a necessary clinical intervention.

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KEY TO MASTERCHART

ADDRESS	
1	URBAN
2	RURAL
MARITAL STATUS	
1	MARRIED
2	SINGLE
3	DIVORCED
4	WIDOW
EDUCATION	
1	ILLITERATE
2	MATRICULATION
3	HIGHER SECONDARY
4	GRADUATION
5	POSTGRADUATION
OCCUPATION	
1	HOME MAKER
2	SKILLED
3	SEMISKILLED
4	SELF SKILLED
5	OTHER
MONTHLY INCOME	
1	NA
2	LESS THAN 10,000
3	10,000-50,000
4	LESS THAN 1 LAKH
5	MORE THAN OR EQUALS TO 1LAKH

FAMILY TYPE	
1	NUCLEAR
2	EXTENDED
3	JOINT
MENSTRUAL CYCLE	
1	IRREGULAR
2	REGULAR
MEDICAL ILLNESS	
1	NOT PRESENT
2	DIABETES MELLITUS -II
3	HYPERTENSION
4	THYROID DYSFUNCTION
5	CARDIOVASCULAR ILLNESS
6	RENAL DYSFUNCTION
7	HEPATIC DYSFUNCTION
NUTRITIONAL ASSESSMENT	
1	VEGETARIAN
2	NON VEGETARIAN
MMSE	
1	24-30
2	18-23
3	0-17
REMEMBERING THINGS ABOUT FAMILY AND FRIENDS E.G OCCUPATIONS, BIRTHDAYS, ADDRESSES	
1	MUCH IMPROVED
2	A BIT IMPROVED

3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
REMEMBERING THINGS THAT HAVE HAPPENED RECENTLY	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
RECALLING CONVERSATIONS A FEW DAYS LATER	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
REMEMBERING HIS/HER ADDRESS AND TELEPHONE NUMBER	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
REMEMBERING WHAT DAY AND MONTH IT IS	
1	MUCH IMPROVED

2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
REMEMBERING WHERE THINGS ARE USUALLY KEPT	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
REMEMBERING WHERE TO FIND THINGS WHICH HAVE BEEN PUT IN A DIFFERENT PLACE FROM USUAL	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
KNOWING HOWTOWORK FAMILIAR MACHINES AROUND THE HOUSE	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE

LEARNING TO USE A NEW GADGET OR MACHINE AROUND THE HOUSE	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
LEARNING NEW THINGS IN GENERAL	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
FOLLOWING A STORY IN A BOOK OR ON TV	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
MAKING DECISIONS ON EVERYDAY MATTERS	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE

4	A BIT WORSE
5	MUCH WORSE
HANDLING MONEY FOR SHOPPING	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
HANDLING FINACIAL MATTERS E.G. THE PENSION, DEALING WITH THE BANK	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
HANDLING OTHEREVERYDAY ARITHMETIC PROBLEMS E.G KNOWING HOW MUCH FOOD TO BUY, KNOWING HOW LONG BETWEEN VISITS FROM FAMILY OR FRIENDS	
1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
USING HIS/HER INTELLIGENCE TO UNDERSTAND WHAT'S GOING ON AND TO REASON THINGS THROUGH	

1	MUCH IMPROVED
2	A BIT IMPROVED
3	NOT MUCH CHANGE
4	A BIT WORSE
5	MUCH WORSE
REMOTE MEMORY, RECENT MEMORY, MENTAL BALANCE, ATTENTION & CONCENTRATION, DELAYED RECALL, IMMEDIATE RECALL, RETENTION FOR SIMILAR PAIRS, RETENTION FOR DISSIMILAR PAIRS, VISUAL RETENTION, RECOGNITION	
LEVELS OF MEMORY	
1	EXCELLENT MEMORY
2	ABOVE AVERAGE MEMORY
3	AVERAGE / MODERATE MEMORY
4	BELOW AVERAGE MEMORY
5	LOW LEVEL MEMORY

S.NO	NAME	MRD NO.	AGE in years	ADDRESS	MARITAL STATUS	EDUCATION	OCCUPATION	INCOME	FAMILY TYPE	WEIGHT IN KILOGRAMS	HEIGHT IN CENTIMETERS	BMI IN KILOGRAMS PER METER SQUARE	SYSTOLIC BP (IN MILIMETERS OF MERCURY)	DIASTOLIC BP IN MILIMETERS OF MERCURY	AGE OF MENARCHE (in years)	LMP (MONTHS BACK)	NUMBER OF DAYS OF MENSES
1	RK	224166	43	1	1	4	2	4	3	72	161	27.7	120	80	13	2	4
2	PK	964674	47	1	1	4	1	1	3	70	161	27	120	80	13	3	2
3	HK	966534	48	1	1	1	1	1	3	57	160	22.8	110	90	12	6	5
4	MK	966659	45	1	1	2	1	1	3	56	162	21.5	110	70	12	3	4
5	SK	966851	39	1	1	4	1	1	1	68	162	26	120	90	14	5	3
6	PD	966143	48	1	1	4	2	3	1	65	161	26	128	80	13	3	3
7	S	966751	42	1	1	2	1	1	3	58	161	22.39	130	80	12	2	4
8	SR	96662	49	1	1	2	1	1	1	60	162	22.9	136	90	12	4	4
9	HK	967293	47	1	1	4	2	4	1	65	161	25	130	80	13	3	4
10	NR	11774	39	1	1	4	2	3	1	66	149	30	150	90	12	4	5
11	G	86293	38	1	1	4	2	3	3	75	161	28.95	120	80	12	3	2
12	DK	925095	45	1	1	2	1	1	3	65	162	24.8	120	80	12	5	2
13	RK	925092	38	1	1	5	2	3	3	70	160	27.34	130	90	13	5	3
14	GK	380120	42	1	1	2	1	1	3	60	162	22.9	120	80	14	4	3
15	R	899974	38	1	1	2	1	1	3	65	161	25	130	80	14	4	4
16	KK	924558	44	1	1	4	2	3	3	56	162	21.37	120	80	14	3	4
17	JK	789811	38	2	1	2	1	1	3	54	162	20.6	130	90	12	3	4
18	SK	527279	39	1	1	1	1	1	3	54	160	21.6	120	80	12	6	3
19	N	926127	40	1	1	4	1	1	3	48	160	18.75	130	80	14	3	4
20	S	121838	42	2	1	2	1	1	1	56	162	21.5	120	80	12	4	5
21	PK	932322	42	2	1	2	1	1	3	54	160	21.6	110	70	13	4	3
22	PK	932054	43	1	1	2	1	1	1	53	160	21.2	120	80	13	3	2
23	MK	930757	40	1	1	2	1	1	3	58	160	23.2	110	70	13	3	2
24	SK	930265	45	1	1	2	1	1	3	59	162	23.6	110	70	13	3	4
25	JJ	678769	39	1	1	2	1	1	3	53	160	21.2	120	80	12	4	3
26	MK	1009108	52	2	1	2	1	1	3	56	160	21.8	120	80	13	3	5
27	IK	68089	45	2	1	2	1	1	3	70	162	28	130	70	13	4	5
28	M	51898	41	1	1	1	1	1	3	49	157	21	100	70	12	2	5
29	R	741879	46	1	4	1	1	1	1	56	162	21.8	120	80	12	2	5
30	K	165959	44	1	1	3	1	1	3	78	162	31	100	70	12	4	4
31	PK	655967	42	2	1	1	1	1	3	66	160	27	110	70	13	3	4
32	JK	317365	43	1	1	3	1	1	3	65	160	25	120	80	12	3	4
33	K	51838	41	1	1	4	1	1	1	66	160	25.7	130	90	12	3	5
34	JK	45005	44	1	1	2	1	1	1	67	162	25.7	130	80	12	3	5
35	N	951519	45	1	1	2	1	1	1	65	162	25.39	120	90	12	4	5
36	PK	683967	42	1	1	4	2	3	3	68	162	22.6	100	90	13	3	5
37	VK	112622	39	1	1	2	1	1	1	70	162	27.34	120	90	14	4	5
38	KK	655967	42	1	1	2	1	1	3	70	160	27.34	130	90	14	4	5
39	AK	1101880	39	1	1	3	1	1	1	64	162	24.6	120	80	12	4	2
40	SK	56984	54	1	1	1	1	1	1	76	162	29.68	130	80	14	4	2
41	HK	129189	39	2	1	2	1	1	3	61	162	23.8	110	90	13	3	4
42	SK	1014096	45	1	1	2	1	1	3	72	160	28.12	120	80	14	3	5
43	SK	971159	40	2	1	2	1	1	1	66	160	25.78	120	80	12	5	2
44	M	1108167	42	1	1	4	2	3	1	75	160	29.2	120	90	12	5	5
45	R	1117931	43	1	1	3	1	1	3	95	160	37	110	90	12	4	5
46	KK	1120333	45	2	1	2	1	1	1	58	160	22.6	150	90	13	2	5
47	HK	1066441	45	1	1	1	1	1	3	65	162	25.39	110	80	14	4	4
48	MD	47295	43	1	1	2	1	1	1	80	160	31.25	110	80	12	3	4
49	N	951519	45	1	1	3	1	1	1	60	162	23.4	120	80	12	4	3
50	SS	994458	43	1	1	3	1	1	1	68	161	26.25	110	70	13	5	3
51	DK	844636	51	1	1	2	1	1	1	72	162	28.12	130	90	13	36	4
52	IV	1144824	52	1	1	2	1	1	3	69	160	26.9	120	80	12	24	3

S.NO	NAME	MRD NO.	DURATION OF MENSTRUAL PRIODS (in days)	CYCLE	MEDICAL ILLNESS	NUTRITIONAL ASSESSMENT	Remembering things about family and friends e.goccupations, birthdays, addresses	Remembering things that have happened recently	Recalling conversations a few days later	Remembering his/her address and telephone number	Remembering what day and month it is	Remembering where things are usually kept	Remembering where to find things which have been put in a different place from usual
1	RK	224166	28	1	3	1	4	4	4	4	3	3	3
2	PK	964674	30	1	3	1	4	4	4	4	3	3	3
3	HK	966534	30	1	1	1	3	3	4	4	3	3	3
4	MK	966659	30	1	2	1	3	4	4	4	3	3	3
5	SK	966851	30	1	1	1	3	4	4	4	3	3	3
6	PD	966143	28	1	1	1	3	3	4	4	3	3	4
7	S	966751	28	1	1	1	3	3	3	4	3	4	4
8	SR	96662	28	1	1	2	4	4	4	4	3	3	3
9	HK	967293	28	1	1	1	3	3	4	4	3	3	3
10	NR	11774	30	1	1	1	3	4	4	4	3	3	3
11	G	86293	30	1	1	2	4	4	4	3	3	3	3
12	DK	925095	30	1	1	2	3	3	4	4	3	3	3
13	RK	925092	30	1	1	1	3	3	3	4	3	3	3
14	GK	380120	30	1	1	1	3	3	3	4	3	3	4
15	R	899974	30	1	1	1	3	3	3	4	3	3	3
16	KK	924558	28	1	1	1	3	3	3	4	3	3	3
17	JK	789811	30	1	1	1	3	3	3	4	3	3	3
18	SK	527279	28	1	4	1	3	3	3	4	3	3	3
19	N	926127	30	1	1	2	3	3	3	4	3	3	3
20	S	121838	30	1	1	1	3	3	3	4	3	3	3
21	PK	932322	30	1	2	2	3	3	3	4	4	3	3
22	PK	932054	28	1	1	1	3	3	3	4	4	3	3
23	MK	930757	30	1	2	1	3	3	3	4	3	3	3
24	SK	930265	30	1	2	2	3	3	4	3	3	3	4
25	JJ	678769	30	1	1	1	3	3	4	3	3	3	3
26	MK	1009108	30	1	1	1	3	3	4	3	3	3	3
27	IK	68089	30	1	1	2	3	3	4	3	3	3	4
28	M	51898	30	1	2	2	3	4	4	3	3	3	3
29	R	741879	28	1	1	1	3	3	4	3	3	3	4
30	K	165959	30	1	1	1	3	4	3	3	3	3	3
31	PK	655967	28	1	1	1	3	3	4	3	3	3	4
32	JK	317365	30	1	1	1	3	3	4	3	3	4	3
33	K	51838	30	1	2	2	3	3	3	4	3	3	3
34	JK	45005	30	1	1	1	3	3	3	4	3	3	4
35	N	951519	30	1	1	1	3	3	3	4	4	3	3
36	PK	683967	30	1	1	1	3	3	3	4	4	3	3
37	VK	112622	30	1	1	1	3	3	3	4	3	3	3
38	KK	655967	30	1	1	1	3	3	4	3	3	3	4
39	AK	1101880	30	1	1	1	3	3	3	4	4	3	3
40	SK	56984	30	1	1	1	3	3	3	4	3	3	3
41	HK	129189	28	1	1	1	3	3	3	4	4	3	3
42	SK	1014096	30	1	1	1	3	3	3	4	3	3	3
43	SK	971159	28	1	1	1	3	3	3	4	3	3	3
44	M	1108167	30	1	4	1	3	3	3	4	4	3	3
45	R	1117931	28	1	1	1	3	3	3	4	4	3	3
46	KK	1120333	30	1	1	1	3	3	3	4	4	3	3
47	HK	1066441	30	1	1	1	3	3	3	4	4	3	3
48	MD	47295	30	1	1	1	3	3	3	4	4	3	3
49	N	951519	28	1	1	1	3	3	3	4	3	3	4
50	SS	994458	28	1	1	1	3	3	3	4	3	3	4
51	DK	844636	30	1	1	1	3	3	3	4	3	3	4
52	IV	1144824	30	1	1	1	4	3	3	4	3	4	4

S.NO	NAME	MRD NO.	Knowing howtowork familiar machines around the house	Learning to use a new gadget or machine around the house	Learning new things in general	Following a story in a book or on TV	Making decisions on everyday matters	Handling money for shopping	Handling finacial matters e.g. the pension , dealing with the bank	Handling othereveryday arithmetic problems e.g knowing how much food to buy , knowing how long between visits from family or friends improved	Using his/her intelligence to understand what's going on and to reason things through	IQCODE	ORIENTATION (total score 10)
1	RK	224166	3	4	4	3	3	3	3	4	3	3.4	10
2	PK	964674	3	4	4	3	3	3	3	4	3	3.4	10
3	HK	966534	3	4	4	3	3	3	3	4	3	3.31	9
4	MK	966659	3	3	4	3	3	3	3	4	3	3.31	8
5	SK	966851	3	3	4	3	4	3	3	4	3	3.3	10
6	PD	966143	3	3	4	3	3	3	3	4	3	3.3	10
7	S	966751	3	4	4	3	3	3	3	4	3	3.5	9
8	SR	96662	3	4	4	3	3	3	3	4	3	3.4	10
9	HK	967293	3	4	4	3	3	3	3	4	3	3.3	9
10	NR	11774	3	4	4	3	3	3	3	4	3	3.37	9
11	G	86293	3	4	3	3	3	3	3	4	3	3.31	10
12	DK	925095	3	4	4	3	3	3	3	4	4	3.37	9
13	RK	925092	3	4	4	3	3	3	3	4	3	3.25	10
14	GK	380120	3	4	4	3	3	3	3	4	3	3.3	9
15	R	899974	3	3	3	3	3	3	3	4	4	3.18	9
16	KK	924558	3	4	4	3	3	3	3	4	3	3.25	9
17	JK	789811	3	4	4	3	3	3	3	4	3	3.3	10
18	SK	527279	3	3	4	3	3	3	3	3	3	3.125	9
19	N	926127	3	3	4	3	3	3	3	4	3	3.18	9
20	S	121838	3	3	4	3	3	3	3	4	3	3.3	10
21	PK	932322	3	3	3	3	3	3	3	3	3	3.1	10
22	PK	932054	3	4	3	3	3	3	3	3	3	3.18	10
23	MK	930757	3	3	3	3	3	3	4	3	3	3.125	10
24	SK	930265	3	4	3	3	3	3	3	4	3	3.25	10
25	JJ	678769	3	4	3	3	3	3	3	4	3	3.18	10
26	MK	1009108	3	4	3	3	3	3	3	3	3	3.12	10
27	IK	68089	3	4	3	3	3	3	3	3	3	3.18	9
28	M	51898	3	4	3	3	3	3	3	4	3	3.25	10
29	R	741879	3	3	3	3	3	3	3	4	4	3.25	10
30	K	165959	4	3	4	3	3	3	3	3	3	3.18	10
31	PK	655967	3	4	3	3	3	3	3	3	4	3.3	10
32	JK	317365	3	4	4	3	3	3	3	3	3	3.25	10
33	K	51838	3	3	3	3	3	3	3	4	3	3.12	9
34	JK	45005	3	4	4	3	3	3	4	3	3	3.3	9
35	N	951519	3	3	3	3	3	3	4	3	3	3.1	9
36	PK	683967	3	3	3	3	3	3	3	3	3	3.1	9
37	VK	112622	3	3	4	3	3	3	3	3	3	3.12	10
38	KK	655967	3	4	3	3	3	3	3	3	3	3.18	10
39	AK	1101880	3	3	3	3	3	3	4	3	3	3.18	9
40	SK	56984	3	4	4	3	3	3	4	4	3	3.2	9
41	HK	129189	3	4	4	3	3	3	4	3	3	3.2	9
42	SK	1014096	3	4	3	3	3	3	4	3	3	3.12	9
43	SK	971159	3	3	4	3	3	3	4	3	3	3.18	9
44	M	1108167	3	4	4	3	3	3	4	4	3	3.3	9
45	R	1117931	3	4	3	3	3	3	4	3	3	3.3	9
46	KK	1120333	3	4	3	3	3	3	4	3	3	3.2	9
47	HK	1066441	3	4	3	3	3	3	4	3	3	3.25	9
48	MD	47295	3	4	3	3	3	3	4	3	3	3.3	9
49	N	951519	3	4	3	3	3	3	3	3	3	3.18	9
50	SS	994458	3	4	4	3	3	3	3	4	3	3.25	9
51	DK	844636	3	4	4	3	3	3	4	4	3	3.28	9
52	IV	1144824	3	4	4	3	3	3	4	4	3	3.3	9

S.NO	NAME	MRD NO.	REGISTRATION (total score 3)	ATTENION AND CONCENTRATION (total score 5)	RECALL (total score 3)	LANGUAGE (total score 9)	MMSE	REMOTE MEMORY	RECENT MEMORY	MENTAL BALANCE	ATTENTION & CONCENTRATION	DELAYED RECALL	IMMEDIATE RECALL	RETENTION FOR SIMILAR PAIRS	RETENTION FOR DISSIMILAR PAIRS	VISUAL RETENTION	RECOGNITION	LEVELS OF MEMORY
1	RK	224166	3	5	3	9	1	5	3	2	2	2	2	3	5	4	3	2
2	PK	964674	3	5	3	9	1	4	3	2	3	2	1	3	5	4	3	2
3	HK	966534	3	5	3	9	1	4	3	2	2	2	1	3	5	4	3	2
4	MK	966659	3	5	2	9	1	4	3	2	3	2	1	3	5	4	3	3
5	SK	966851	3	4	3	9	1	4	3	2	3	2	1	3	5	4	2	3
6	PD	966143	3	5	3	9	1	3	3	2	3	2	1	3	5	5	3	2
7	S	966751	3	3	3	9	1	4	3	4	3	2	1	3	5	5	2	2
8	SR	96662	3	4	3	9	1	5	3	2	3	2	1	3	5	4	2	2
9	HK	967293	3	4	3	9	1	1	3	2	3	2	1	3	5	5	2	3
10	NR	11774	3	4	3	9	1	1	3	2	3	2	1	3	5	5	3	2
11	G	86293	3	4	3	9	1	1	3	2	3	2	1	3	5	5	3	2
12	DK	925095	3	4	3	9	1	5	3	2	3	2	1	3	5	4	2	2
13	RK	925092	3	4	3	9	1	1	3	2	3	2	1	3	5	4	2	2
14	GK	380120	3	4	3	9	1	5	3	2	3	2	1	3	5	4	3	3
15	R	899974	3	4	3	9	1	5	3	2	3	2	1	3	5	4	3	2
16	KK	924558	3	4	3	9	1	1	3	2	3	2	1	3	5	4	2	2
17	JK	789811	3	3	3	9	1	5	3	2	2	2	2	3	5	4	3	2
18	SK	527279	3	5	3	9	1	3	3	5	3	2	1	3	1	4	4	3
19	N	926127	3	5	3	9	1	1	3	2	2	2	2	3	5	5	2	5
20	S	121838	3	3	3	9	1	1	3	2	2	2	1	3	5	2	3	5
21	PK	932322	3	3	3	9	1	3	3	2	3	2	1	3	5	5	3	2
22	PK	932054	3	5	3	9	1	3	3	2	3	2	1	3	5	5	3	2
23	MK	930757	3	4	2	9	1	3	3	5	3	2	1	3	5	4	4	3
24	SK	930265	3	3	2	9	1	4	3	5	3	2	1	3	5	2	2	3
25	JJ	678769	3	4	3	9	1	3	3	2	2	2	1	3	5	4	2	2
26	MK	1009108	3	4	3	9	1	3	3	2	2	2	1	1	3	4	3	3
27	IK	68089	3	4	3	9	1	4	3	3	3	2	1	3	4	4	3	4
28	M	51898	3	4	3	9	1	4	3	5	3	2	1	3	5	2	2	3
29	R	741879	3	4	2	9	1	5	3	5	4	2	1	3	5	4	3	4
30	K	165959	3	4	3	9	1	5	3	5	3	2	1	3	5	4	3	3
31	PK	655967	3	4	3	9	1	3	3	1	3	2	1	3	5	2	2	3
32	JK	317365	3	4	2	9	1	1	3	1	3	2	1	3	5	2	3	3
33	K	51838	3	3	3	9	1	3	3	1	3	2	1	3	5	1	3	5
34	JK	45005	3	3	3	9	1	2	3	1	3	2	1	3	5	1	3	3
35	N	951519	3	3	3	9	1	3	3	5	3	2	1	3	5	5	3	3
36	PK	683967	3	3	3	9	1	5	3	5	3	2	1	3	5	5	3	3
37	VK	112622	3	3	3	9	1	3	3	2	3	2	1	3	5	5	3	3
38	KK	655967	3	3	3	9	1	5	3	5	3	2	1	3	5	4	3	4
39	AK	1101880	3	4	3	9	1	3	3	1	3	2	1	3	5	2	2	3
40	SK	56984	3	3	3	9	1	4	3	5	4	5	1	3	5	4	3	5
41	HK	129189	3	3	3	9	1	5	3	4	4	2	1	3	5	5	3	4
42	SK	1014096	3	3	3	9	1	3	3	5	3	2	1	3	5	2	2	3
43	SK	971159	3	3	3	9	1	5	3	5	3	2	1	3	5	4	2	3
44	M	1108167	3	3	3	9	1	3	3	5	3	2	1	3	5	5	3	3
45	R	1117931	3	3	3	9	1	3	3	5	3	2	1	3	5	5	3	3
46	KK	1120333	3	3	3	9	1	4	3	5	3	2	1	3	5	2	2	3
47	HK	1066441	3	3	3	9	1	3	3	5	4	2	1	3	5	4	3	4
48	MD	47295	3	3	3	9	1	3	3	5	3	2	1	3	5	5	3	3
49	N	951519	3	4	3	9	1	3	3	5	4	2	1	3	5	5	3	4
50	SS	994458	3	4	3	9	1	3	3	5	3	2	1	3	5	4	3	4
51	DK	844636	3	3	3	9	1	5	3	4	3	5	1	3	5	4	3	4
52	IV	1144824	3	3	3	9	1	4	3	5	4	5	1	3	5	4	3	5

S.NO	NAME	MRD NO.	AGE in years	ADDRESS	MARITAL STATUS	EDUCATION	OCCUPATION	INCOME	FAMILY TYPE	WEIGHT IN KILOGRAMS	HEIGHT IN CENTIMETERS	BMI IN KILOGRAMS PER METER SQUARE	SYSTOLIC BP (IN MILIMETERS OF MERCURY)	DIASTOLIC BP IN MILIMETERS OF MERCURY	AGE OF MENARCHE (in years)	LMP (MONTHS BACK)	NUMBER OF DAYS OF MENSES
53	LD	152768	44	1	1	2	1	1	3	48	160	18.7	120	90	13	12	2
54	SR	1151887	55	1	1	1	1	1	1	48	162	18.46	130	90	14	96	2
55	SK	1068735	52	1	1	2	1	1	3	50	160	19.5	140	80	12	36	4
56	RR	966231	48	1	4	2	1	1	3	68	161	26.25	130	80	14	84	5
57	MK	96474	54	1	1	2	1	1	1	60	164	23	120	80	14	60	3
58	VR	966626	50	1	1	2	1	1	3	67	162	25.7	110	90	12	36	2
59	SD	966939	55	1	1	1	1	1	1	55	162	20.7	120	80	14	18	3
60	NK	960115	46	1	1	4	2	4	3	70	162	26.71	130	80	12	18	4
61	VR	924978	55	2	1	2	1	1	3	78	161	30.11	120	90	13	24	2
62	KK	929701	51	1	1	2	1	1	3	72	162	27.4	130	90	12	36	4
63	SK	925818	50	2	1	2	1	1	3	60	162	22.9	120	90	12	18	4
64	MS	932949	50	1	1	1	1	1	3	65	160	26	110	70	13	24	2
65	PK	932927	50	1	1	3	1	1	3	60	160	24	110	70	13	24	4
66	KK	932922	47	1	1	3	1	1	3	67	157	27.2	110	70	12	18	4
67	PK	101622	54	2	1	1	1	1	3	68	162	26.56	130	80	13	60	5
68	AW	735356	51	1	1	5	2	5	1	85	162	34	110	80	14	36	5
69	BK	774633	51	1	1	1	1	1	3	70	162	27.34	120	80	12	36	5
70	S	666517	54	2	1	2	1	1	1	70	162	27.34	120	80	13	48	4
71	SR	992575	50	1	1	2	1	1	3	68	162	26.56	110	80	12	36	4
72	BR	687570	55	1	1	3	1	1	1	75	160	29.2	120	80	12	96	4
73	MK	80726	54	2	1	2	1	1	3	58	162	23.2	130	80	12	36	3
74	AK	757454	54	2	1	1	1	1	1	56	162	21.8	110	80	12	60	2
75	AV	1003994	54	1	1	4	1	1	3	70	160	28	110	70	13	24	2
76	SK	91958	54	1	1	4	1	1	1	75	162	30	150	70	13	24	5
77	SK	1071493	50	1	1	2	1	1	1	60	160	23.4	110	80	13	24	3
78	MK	1014125	55	2	1	2	1	1	3	69	162	26.5	110	80	14	48	4
79	NS	1062768	54	1	3	2	1	1	1	72	160	28.12	120	80	12	36	4
80	CK	790686	51	1	1	2	1	1	3	64	162	24.6	120	80	14	48	4
81	PK	43209	49	1	1	2	1	1	1	70	162	28	130	80	13	18	3
82	KK	1030208	50	2	1	2	1	1	3	62	160	24.8	120	80	12	18	2
83	GK	823720	51	1	1	1	1	1	1	58	162	22.6	120	80	12	18	4
84	BK	10521	45	2	1	3	1	1	1	80	162	31.2	130	80	13	18	3
85	S	1111077	47	1	1	2	1	1	1	72	162	28.1	110	90	14	18	2
86	GK	823170	51	1	1	2	1	1	1	58	160	22.6	120	80	12	12	3
87	PK	1120219	53	1	1	2	1	1	1	56	160	21.8	120	80	14	48	4
88	SD	71641	51	1	1	1	1	1	3	61	162	23.8	130	80	14	24	4
89	GD	1072430	55	2	1	2	1	1	3	68	162	26	110	70	13	30	4
90	SK	961392	50	2	1	2	1	1	3	47	164	18.35	128	80	12	72	4
91	KK	947769	50	1	1	2	1	1	1	107	162	41.1	130	80	12	18	4
92	N	951519	45	1	1	3	1	1	1	67	160	26.8	120	70	13	60	4
93	KK	1030208	50	1	1	2	1	1	1	58	160	23.2	120	80	12	60	4
94	SR	25963	49	1	1	2	1	1	1	68	162	26.15	130	80	13	12	4
95	SS	60325	53	1	1	2	1	1	1	63	162	24.2	130	70	13	60	4
96	AR	147801	48	1	1	4	1	1	3	79	160	30.8	120	70	12	24	4
97	RD	50975	50	1	1	1	1	1	1	68	162	26.15	120	70	12	36	4
98	M	115785	50	1	1	2	1	1	3	82	162	32	130	80	12	36	4
99	S	1068870	51	1	1	3	1	1	1	92	162	35.3	120	80	13	60	5
100	A	1080841	49	1	1	4	1	1	3	70	162	28	120	80	12	36	5

S.NO	NAME	MRD NO.	DURATION OF MENSTRUAL PRIODS (in days)	CYCLE	MEDICAL ILLNESS	NUTRITIONAL ASSESSMENT	Remembering things about family and friends e.goccupations, birthdays, addresses	Remembering things that have happened recently	Recalling conversations a few days later	Remembering his/her address and telephone number	Remembering what day and month it is	Remembering where things are usually kept	Remembering where to find things which have been put in a different place from usual
53	LD	152768	30	1	1	1	3	4	4	4	3	4	4
54	SR	1151887	30	1	3	1	3	3	4	4	4	3	4
55	SK	1068735	30	1	1	1	3	3	3	4	3	3	3
56	RR	966231	28	1	1	1	4	4	4	4	3	3	3
57	MK	96474	30	1	2	1	4	4	4	4	3	3	3
58	VR	966626	30	1	2	2	4	4	4	4	3	3	3
59	SD	966939	30	1	1	2	3	3	3	4	3	3	4
60	NK	960115	30	1	1	1	4	4	4	4	3	3	4
61	VR	924978	30	1	1	1	4	4	4	4	3	3	4
62	KK	929701	28	1	1	1	3	3	4	4	3	3	4
63	SK	925818	30	1	1	1	3	3	3	4	3	3	3
64	MS	932949	30	1	2	2	3	3	3	4	3	3	4
65	PK	932927	30	1	1	2	3	3	3	4	3	3	3
66	KK	932922	30	1	1	2	3	4	3	4	4	3	3
67	PK	101622	30	1	1	1	4	4	3	4	4	4	4
68	AW	735356	30	1	1	1	3	3	3	3	3	3	4
69	BK	774633	30	1	1	1	3	3	3	4	4	3	4
70	S	666517	30	1	1	1	3	3	3	4	4	3	4
71	SR	992575	30	1	1	1	3	3	3	4	4	3	3
72	BR	687570	30	1	1	1	3	3	3	4	4	3	3
73	MK	80726	28	1	1	1	3	3	3	4	4	4	4
74	AK	757454	28	1	1	1	3	3	3	4	3	3	4
75	AV	1003994	30	1	2	1	3	3	4	3	3	3	4
76	SK	91958	28	1	3	1	3	3	4	3	4	3	4
77	SK	1071493	30	1	1	1	3	3	4	3	4	3	4
78	MK	1014125	30	1	2	1	3	3	3	4	4	3	4
79	NS	1062768	30	1	4	1	3	3	3	4	4	3	4
80	CK	790686	30	1	1	2	3	3	3	4	4	3	3
81	PK	43209	30	1	1	1	3	3	3	4	4	3	4
82	KK	1030208	30	1	1	1	3	3	4	4	4	3	4
83	GK	823720	28	1	1	1	3	3	4	3	3	3	4
84	BK	10521	28	1	4	1	3	4	3	4	4	3	3
85	S	1111077	30	1	1	1	3	3	3	4	3	3	4
86	GK	823170	30	1	1	1	3	3	3	4	3	3	4
87	PK	1120219	30	1	4	1	3	3	3	4	4	3	4
88	SD	71641	30	1	1	1	3	3	3	4	3	3	3
89	GD	1072430	30	1	2	1	3	4	4	3	3	4	4
90	SK	961392	28	1	1	1	4	4	4	4	3	3	3
91	KK	947769	30	1	4	1	4	3	3	4	4	3	3
92	N	951519	30	1	1	2	3	3	3	4	4	3	3
93	KK	1030208	30	1	2	1	4	3	3	4	4	3	3
94	SR	25963	30	1	1	1	3	3	3	4	3	3	4
95	SS	60325	30	1	1	1	4	4	4	4	3	3	4
96	AR	147801	28	1	4	1	3	3	4	4	4	3	3
97	RD	50975	30	1	1	1	3	3	3	4	4	3	4
98	M	115785	28	1	1	2	3	3	4	3	4	3	4
99	S	1068870	30	1	1	1	3	3	3	4	4	4	4
100	A	1080841	30	1	1	1	3	3	4	3	3	3	4

S.NO	NAME	MRD NO.	Knowing howtowork familiar machines around the house	Learning to use a new gadget or machine around the house	Learning new things in general	Following a story in a book or on TV	Making decisions on everyday matters	Handling money for shopping	Handling finacial matters e.g. the pension , dealing with the bank	Handling othereveryday arithmetic problems e.g knowing how much food to buy , knowing how long between visits from family or friends improved	Using his/her intelligence to understand what's going on and to reason things through	IQCODE	ORIENTATION (total score 10)
53	LD	152768	3	4	4	3	3	3	4	4	3	3.2	9
54	SR	1151887	3	3	4	3	3	3	4	4	3	3.3	9
55	SK	1068735	3	4	3	3	3	3	4	3	3	3.28	9
56	RR	966231	3	3	4	3	3	3	3	4	3	3.56	9
57	MK	96474	3	3	4	3	3	3	3	4	3	3.56	9
58	VR	966626	3	3	4	3	3	3	3	3	3	3.31	9
59	SD	966939	3	4	4	3	3	3	3	4	3	3.3	9
60	NK	960115	3	4	4	3	3	3	3	4	3	3.5	9
61	VR	924978	3	4	4	3	3	3	3	4	3	3.5	9
62	KK	929701	3	4	4	3	3	3	3	4	3	3.3	9
63	SK	925818	3	4	4	3	3	3	3	4	3	3.2	9
64	MS	932949	3	4	4	3	3	3	3	4	3	3.31	9
65	PK	932927	3	4	4	3	3	3	3	4	3	3.2	9
66	KK	932922	3	4	4	3	3	4	3	4	3	3.43	7
67	PK	101622	3	4	4	3	3	3	4	3	3	3.5	9
68	AW	735356	3	3	3	3	3	3	3	3	3	3.06	9
69	BK	774633	3	3	3	3	3	3	4	4	3	3.3	9
70	S	666517	3	4	4	3	3	3	4	3	3	3.3	9
71	SR	992575	3	4	3	3	3	3	4	4	3	3.3	9
72	BR	687570	3	4	4	3	3	3	4	3	3	3.3	9
73	MK	80726	3	4	4	3	3	4	4	4	3	3.5	9
74	AK	757454	3	4	4	3	3	3	3	4	3	3.3	9
75	AV	1003994	3	4	3	3	3	3	3	4	3	3.25	9
76	SK	91958	3	4	4	3	3	3	4	4	4	3.5	9
77	SK	1071493	3	4	4	3	3	3	3	4	4	3.4	8
78	MK	1014125	3	4	3	3	3	3	4	4	3	3.25	8
79	NS	1062768	3	4	4	3	3	3	3	3	3	3.3	9
80	CK	790686	3	4	4	3	3	3	4	4	3	3.3	9
81	PK	43209	3	4	3	3	3	4	4	4	3	3.4	9
82	KK	1030208	3	3	3	3	3	3	4	3	3	3.3	9
83	GK	823720	3	4	3	3	3	3	4	4	3	3.3	10
84	BK	10521	3	4	4	3	3	4	3	4	3	3.43	9
85	S	1111077	3	4	3	3	3	3	4	4	3	3.3	9
86	GK	823170	3	4	4	3	3	3	4	4	3	3.25	10
87	PK	1120219	3	4	4	3	3	3	3	4	3	3.3	9
88	SD	71641	3	4	4	3	3	3	4	3	3	3.2	9
89	GD	1072430	3	4	4	3	3	3	3	4	3	3.4	10
90	SK	961392	3	3	4	3	3	3	3	3	3	3.31	9
91	KK	947769	3	4	4	3	3	3	3	4	3	3.3	9
92	N	951519	3	4	4	3	3	3	3	4	3	3.3	9
93	KK	1030208	3	4	3	3	3	4	4	4	4	3.5	9
94	SR	25963	3	4	4	3	3	3	3	4	3	3.3	9
95	SS	60325	3	4	4	3	3	3	3	4	4	3.5	9
96	AR	147801	3	4	4	3	3	4	4	3	3	3.4	9
97	RD	50975	3	4	4	3	3	4	4	4	3	3.5	9
98	M	115785	3	4	4	3	3	3	3	4	3	3.3	9
99	S	1068870	3	4	3	3	3	4	4	3	4	3.5	9
100	A	1080841	3	4	3	3	3	3	3	4	3	3.25	10

S.NO	NAME	MRD NO.	REGISTRATION (total score 3)	ATTENION AND CONCENTRATION (total score 5)	RECALL (total score 3)	LANGUAGE (total score 9)	MMSE	REMOTE MEMORY	RECENT MEMORY	MENTAL BALANCE	ATTENTION & CONCENTRATION	DELAYED RECALL	IMMEDIATE RECALL	RETENTION FOR SIMILAR PAIRS	RETENTION FOR DISSIMILAR PAIRS	VISUAL RETENTION	RECOGNITION	LEVELS OF MEMORY
53	LD	152768	3	3	3	9	1	4	3	5	4	5	1	3	5	5	3	4
54	SR	1151887	3	3	3	9	1	4	3	5	4	2	1	3	5	4	3	5
55	SK	1068735	3	3	2	9	1	4	3	5	4	2	1	3	5	4	3	4
56	RR	966231	3	3	3	9	1	5	3	3	3	4	1	3	5	4	3	3
57	MK	96474	3	3	3	9	1	5	3	3	3	4	1	3	5	4	3	3
58	VR	966626	3	3	3	9	1	4	3	4	3	4	1	3	5	4	3	3
59	SD	966939	3	3	3	9	1	5	4	4	4	4	1	3	5	4	3	5
60	NK	960115	3	4	3	9	1	5	3	4	4	2	1	3	5	5	3	4
61	VR	924978	3	4	3	9	1	5	3	4	4	5	1	3	5	4	3	4
62	KK	929701	3	3	3	9	1	5	3	4	4	2	1	3	5	4	3	4
63	SK	925818	3	3	3	9	1	5	3	3	3	2	1	3	5	4	3	4
64	MS	932949	3	3	3	9	1	4	3	5	4	2	1	3	5	4	3	5
65	PK	932927	3	4	2	9	1	4	3	5	4	5	1	3	5	4	3	5
66	KK	932922	3	3	3	9	1	5	3	4	3	5	1	3	5	4	3	4
67	PK	101622	3	3	3	9	1	5	3	5	4	2	1	3	5	4	3	5
68	AW	735356	3	4	2	9	1	1	3	2	3	2	1	3	1	4	2	2
69	BK	774633	3	3	3	9	1	4	3	1	4	2	1	3	5	5	4	4
70	S	666517	3	4	3	9	1	5	3	4	3	5	1	3	5	5	3	4
71	SR	992575	3	3	3	9	1	5	3	5	3	4	1	3	5	5	3	4
72	BR	687570	3	4	3	9	1	4	3	5	4	5	1	3	5	4	3	4
73	MK	80726	3	4	3	9	1	5	3	5	4	5	1	3	5	4	3	4
74	AK	757454	3	3	3	9	1	4	3	5	4	2	1	3	5	4	3	5
75	AV	1003994	3	3	2	9	1	5	3	4	3	2	1	3	5	5	3	4
76	SK	91958	3	4	2	9	1	4	3	2	3	2	1	3	5	4	2	3
77	SK	1071493	3	3	2	9	1	4	3	5	3	2	1	3	5	4	2	4
78	MK	1014125	3	4	3	9	1	1	3	1	3	2	1	3	5	2	3	2
79	NS	1062768	3	3	3	9	1	2	3	1	2	2	1	3	5	2	3	5
80	CK	790686	3	3	3	9	1	2	3	1	2	1	5	3	5	4	3	5
81	PK	43209	3	3	3	9	1	2	3	1	3	2	1	3	5	4	3	4
82	KK	1030208	3	3	2	9	1	2	3	5	4	5	1	3	5	4	3	4
83	GK	823720	3	4	3	9	1	4	3	5	4	2	1	3	5	4	3	5
84	BK	10521	3	4	3	9	1	5	3	4	3	5	1	3	5	4	3	4
85	S	1111077	3	4	3	9	1	4	3	5	4	2	1	3	5	4	3	5
86	GK	823170	3	4	3	9	1	5	3	4	4	2	1	3	5	5	3	4
87	PK	1120219	3	4	3	9	1	5	3	5	3	2	1	3	5	4	3	4
88	SD	71641	3	4	3	9	1	4	3	5	4	5	1	3	5	4	3	5
89	GD	1072430	3	3	2	9	1	1	3	1	2	2	1	3	5	1	3	2
90	SK	961392	3	4	3	9	1	5	3	4	3	5	1	3	5	4	3	4
91	KK	947769	3	4	3	9	1	1	3	3	3	4	1	3	5	4	3	3
92	N	951519	3	4	3	9	1	1	3	3	3	4	1	3	5	4	3	3
93	KK	1030208	3	4	3	9	1	4	3	1	4	2	1	3	5	2	3	5
94	SR	25963	3	4	3	9	1	1	3	4	3	2	1	3	5	5	3	4
95	SS	60325	3	3	3	9	1	1	3	1	3	2	1	3	5	2	3	3
96	AR	147801	3	4	3	9	1	2	3	1	3	4	1	3	5	2	3	2
97	RD	50975	3	3	3	9	1	1	3	1	2	2	1	3	5	2	3	2
98	M	115785	3	4	2	9	1	5	3	5	3	2	1	3	5	4	3	4
99	S	1068870	3	3	3	9	1	1	3	2	2	2	1	3	5	1	3	2
100	A	1080841	3	3	2	9	1	3	3	3	3	3	1	3	4	4	3	4

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Date 20/4/2021

The Principal,
DMC,Ludhiana.

Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 22.01.2021 has approved the plan of thesis of **Dr. Tanu,** a student of your college for **MD Psychiatry** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
To study neurocognitive impairment in perimenopausal and postmenopausal females

Supervisor
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Co-Supervisor
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Dr. Suman Puri
Prof.,
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The student has to submit the three copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

1. ***If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.***
2. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF MEDICINE

IN

PSYCHIATRY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

NOVEMBER, 2019

DR. TANU

DEPARTMENT OF PSYCHIATRY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES
For the degree of	MD Psychiatry
Name of the candidate	Dr. Tanu
Supervisor	Dr. Navkiran Sooch Mahajan, Professor, Department of Psychiatry, DMCH, Ludhiana
Co-supervisor	Dr. Ranjive Mahajan, Professor & Head, Department of Psychiatry, DMCH, Ludhiana Dr. Suman Puri , Professor and Unit Head, Department of Obs and Gynae, DMCH, Ludhiana
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: Cognitive impairment is a frequent complaint during the menopausal transition and among postmenopausal women. Changes in the memory correspond with diminished estrogen production. Further many perimenopausal and postmenopausal women report sleep concerns, depression and hot flushes and these factors may contribute to cognitive decline. The most common complaints were difficulty recalling words or numbers, needing memory aids and forgetting why one was involved in certain behaviour. Few of subjective memory complaints were significantly associated with impairment in attention, recall, and verbal memory.

Aim of Study: To study impairment in neuropsychological performance in perimenopausal and post menopausal females

Materials & Methods: The study will be conducted on the 50 perimenopausal and 50 postmenopausal females in the age group of 38-55 years presenting to Department Of Psychiatry and obs and gyane, DMC&H Ludhiana . After clinical assessment, socio-demographic Performa will be filled. Subjects will be further assessed using MMSE, PGI memory scale and IQCODE Scale.

Clinical Significance: The study will help us understand decline in estrogen around menopause are associated with decline in cognitive functioning. Post menopausal females have worse performance in different domain of cognition, so early and repeated assessment of cognition in this period is recommended.

Keywords: Cognition, memory, perimenopause, postmenopausal stage, attention, recall, menopausal transition, neurocognitive impairement.

(Signature)	(Signature)	(Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES"** exist in the Department of Psychiatry, DMC&H, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis is genuine and is collected by the candidate herself under our supervision and guidance.

Supervisor

Dr. Navkiran Sooch Mahajan
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Co-Supervisor(s)

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Place: _____

Date: _____

APPROVAL PROFORMA
BYRESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	DR.TANU
Department	PSYCHIATRY
Topic of Thesis	TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENO-PAUSAL AND POSTMENOPAU-SAL FEMALES.
Likely date of appearing in PG examination	MAY, 2022
Date of enrollment	11th May, 2019
Name of Head of Department	DR. RANJIVE MAHAJAN
1) Supervisor **2) Co-Supervisor**	Dr. Navkiran Sooch Mahajan Dr. Ranjive Mahajan Dr. Suman Puri
Signature of Members of Re-search Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
Dr. Jaspal Singh (Professor & Head, Surgery)	Mr. A K Jindal (Member, Ethics Committee)
Dr. Dinesh Gupta (Professor & Head, Medicine)	Dr. Anu Sharma (Professor, Anatomy)
Dr. Sandeep Kaushal (Assistant Dean Academics)	Dr. Deepinder K Chhina (Professor & Head, Microbiology)
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Dr. Gurpreet S Wander (Vice Principal)	Dr. Gurpreet S Wander (Vice Principal)
	Dr. Gagandeep Singh (Secretary, Ethics Committee Professor & Head, Neurology)

Approved: Yes / ~~No~~

Dr. Sandeep Puri
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Research Committee
Chairperson
Research Committee

Approved: Yes / ~~No~~

Prof. Arvind Malhotra
Chairperson
Ethics Committee
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Ethics Committee

BABA FARID UNIVERSITY OF HEALTH SCIENCES, FARIDKOT

PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

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2	NAME OF THE INSTITUTE	DAYANAND MEDICAL COLLEGE AND HOSPITAL, LUDHIANA, PUNJAB.
3	COURSE OF STUDY AND SUBJECT	MD PSYCHIATRY
4	DATE OF ADMISSION OF COURSE	11th MAY , 2019
5	TITLE OF THE TOPIC	TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL WOMEN.

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

Cognition is the mental action or process of acquiring knowledge and understanding through thought, experience and the senses. Cognitive disorders are classified as cognitive aging, mild cognitive impairment (MCI) and dementia. MCI is episodic memory loss without dementia. It is demonstrable memory impairment, but other cognitive abilities are not impaired and daily activities are intact. Neurophysiological changes in the brain begin and clinical manifestations like cognitive decline are present with age, that's defined as MCI. When these symptoms are persistent with cognitive impairment, it eventually will progress to dementia. But people with MCI seems to remain stable. During that transitional period she experiences complaints related to memory and this period also impact cognitive function later in life. It's important to identify the cognitive changes associated with perimenopausal transition so as to prevent the misattribution of symptoms to the other menopausal related neurodegenerative diseases like frontotemporal dementia and Alzheimer disease. As the age advances, the perimenopausal and postmenopausal females started having decline in their cognition. Perimenopause is the stage just before the menstrual cycle stops entirely .Women in perimenopausal age group reports problems with recall of words and numbers, distruptions in every day behaviour (eg. losing household items),difficulty concentrating ,needing to use memory aids and forgetting events (eg appointments).Women in early stages of menopause may experience more noticeable issues with cognition. Post menopausal had worse performance in different domains of cognition, so early and repeated assessment of cognition in this period is recommended. The menopause is associated with marked decrease in concentrations of circulating estradiol and this change has the potential to affect the CNS. Menopause symptoms cause cognitive difficulties during the menopause transition. Factors contributing to cognitive declines have not yet been clearly identified. It is postulated estrogen influences hippocampal and prefrontal cortex function and the cognitive functions sub served by these brain regions, including verbal memory

and executive function. The menopausal transition begins when a woman experiences either: a) a change in her usual intercycle interval of >7days or b) a skipped menstrual period. It is divided into early and late stages. In the early transition, amenorrhea is intermittent and relatively infrequent. The late transition begins when a woman skips at least two cycles and experiences at least 60 days of amenorrhea. The postmenopause is divided into two stages that is early stage, defined as the first five years after the final menstrual period. This period of time is further divided into *a* and *b*, with *a* being the first year of amenorrhea and *b* being the next four years. This period is significant for being a time where ovarian hormones undergo further decline, with some intermittent fluctuations. The late postmenopausal stage, begins five years after the final menstrual period and continues until demise. A majority of women will experience vasomotor symptoms, vaginal dryness, poor sleep, and depressed mood have all been found to worsen during the menopausal transition. As there is increased risk of cognitive complaints, its important to work on different domains of cognition, so early and repeated assessment of cognition in this recommended. The study, draw attention towards neurocognitive impairment in perimenopausal and postmenopausal females who are at high risk, can experience cognitive decline affecting their day to day life. In this study, the level and the severity of impairment is to be assessed.

6.2 REVIEW OF LITERATURE

Given the high prevalence of cognitive complaints from middle age women, it is important to identify predisposing factors and to determine when the symptoms represent a potentially serious neurological disorder. Fortunately, midlife dementia is rare for a women in her 50's, the estimated incidence is less than 0.1 per 1000 person years.[1]

If endogenous estrogen influences cognitive function, this effect might be more apparent during menopausal transition when estrogen levels are decreased dramatically and 60% of women report memory problems. On performing the MMSE as a measure of global brain function, postmenopausal females showed greater number of females having abnormal test results when compared with premenopausal ones, but this difference didn't reach a significant value.[2]

The Seattle midlife women's health study reported that of 230 women aged 33 to 55 years who were interviewed about their perceived cognitive function, 60% noticed an unfavorable memory change over past few years.[3]

Hormonal cessation by menopausal change is one of the causes in cognitive disorders and neuropathological changes in brain that can lead to mild cognitive impairment and eventually dementia. Prevention of MCI is important for decreasing progression to dementia.[4]

Cognitive changes that occur during mid-life and beyond are linked to both aging and the menopause transition. Studies in women suggest that the age at menopause onset can impact cognitive status later in life; yet, little is known about memory changes that occur during the transitional period to the post-menopausal state.[5]

Recognizing the cognitive changes associated with menopause and distinguishing from cognitive impairment resulting from other etiologies—including neurodegenerative diseases such as Alzheimer disease—has important clinical implications both for treatment and for prognosis.[6]

Estrogen is a master regulator that functions through a network of estrogen receptors to ensure that the brain effectively responds at rapid, intermediate and long timescales to regulate energy metabolism in the

brain via coordinated signalling and transcriptional pathways .The estrogen receptor network becomes uncoupled from the bioenergetics system during the perimenopausal transition and, as a corollary; a hypo metabolic state associated with neurological dysfunction can develop. This hypo metabolic state might increase the risk of developing neurodegenerative diseases later in life.[7]

The SWAN study found that cognitive performance was transiently reduced during the perimenopause and that during this time learning and verbal memory did not improve with repeated testing.[8]

In a recent cross-sectional study of cognition in the different stages of the perimenopause, 117 middle-aged women were divided into four separate categories: late reproductive with change in menstrual flow or cycle; early menopause transition with persistent menstrual irregularity; late menopause transition with amenorrhea of 60 days or more; and early menopause in the first 12 months after the final menstrual period. The women were investigated with a battery of neuropsychological tests covering six cognitive domains. The women in the first year postmenopause performed significantly worse on measures of verbal learning, verbal memory and fine motor function than women in the late reproductive and late menopausal transition phases. Women in the first year postmenopause also performed significantly worse in attention and working memory tests than women in the late transition phase. The differences were not related to menopausal symptoms, depression or anxiety, or to serum estradiol or follicle stimulating hormone levels at the time of testing. The effect of the menopause on cognition at the time of the menopause and the possible relationship of the menopause to the later development of MCI and AD requires further investigation.[8]

Perimenopausal women reported significantly more frequent forgetting and less contentment with their memory than postmenopausal women.[9]

In a 2-year sub-study performed at the Chicago, Illinois, site of the Study of Women's Health Across the Nation (SWAN), processing speed and working memory were unaffected by the menopause transition.[10]

The majority of women report forgetfulness and concentration difficulties during the menopausal transition; however, few studies have examined objective cognitive functioning in women as they transition through menopause. The Melbourne Women's Midlife Health Project was the first to investigate the relationship between reproductive aging stage and measured memory performance.[11]

SWAN showed a decrement in verbal memory and processing speed in late perimenopause that improved in the postmenopausal period and that could not be explained by symptoms. Two factors may be important in explaining differences in outcomes between the SWAN and the current study: criteria for staging menopause and time spent in the postmenopausal stage. In the current study we used updated criteria to define stages of reproductive aging, and those criteria differ from the SWAN criteria. SWAN defined early perimenopause as decreased predictability of menses and fewer than 3 months of amenorrhea. In comparison, we defined early transition as persistent cycle irregularity, defined as ≥7 day difference in length of consecutive cycles on at least two occasions in the prior 10 cycles. SWAN defined late perimenopause as 3-11 months of amenorrhea, and we defined late transition as an interval of amenorrhea of ≥ 60 days. Both studies defined postmenopause as beginning at the final menstrual period.[12]

Studies showed that there are known hormonal changes that occur across the menopausal transition and they are associated with various symptoms and markers of health in women traversing the menopause.[13]

Although 60% of women report memory problems during the menopause transition (MT), information about measured cognitive performance during MT is scant.[14]

A majority of women will experience bothersome symptoms related to declining and/or fluctuating levels of estrogen during their menopausal transition. Vasomotor symptoms, vaginal dryness, poor sleep, and depressed mood have all been found to worsen during the menopausal transition.[15]

Androstenedione, released from the residual transitional menopausal ovary, was positively associated with impaired performance.[16]

Onset of menstrual irregularity after previously regular cycles marks the onset of the menopausal transition.[17]

Memory changes were increased role burden and stress, getting older, physical health, menstrual cycle changes/hormones, inadequate concentration, and emotional factors. Stress, physical health, and aging as attributions, rather than the menstrual cycle or hormone use, were linked to most types of memory change.[18]

Abilities such as memory, spatial ability, and reasoning also are more likely to decline with normal aging, whereas verbal abilities, information, and comprehension tend to show stability.[19]

6.3 AIMS AND OBJECTIVES OF THE STUDY

To study impairment in neuropsychological performance in perimenopausal and post menopausal females.

7. MATERIALS AND METHODS

7.1 Source of Data

Study will be conducted on the perimenopausal and postmenopausal females of age group 38-55 years old presenting to DMC&H Ludhiana.

7.2 METHOD OF COLLECTION OF DATA

SAMPLE COLLECTION: The study would include the 50 females of perimenopausal and 50 postmenopausal stage in age group of 38-55 years old presenting to the Department of Psychiatry in DMC&H Ludhiana .

INCLUSION CRITERIA:

- Women who have given the consent for study.
- Age groups between 38-55 years.
- Females having premature ovarian failure having loss of normal ovarian function after age of 38 years presenting with symptoms of irregular menses, hot flushes and irritability.
- Perimenopausal females, who have irregular periods with inter-cycle gap of more than or equals to 60 days or having vasomotor symptoms.
- Postmenopausal females, who have not had periods for at least 12 months and are not using hormonal contraception, presenting to DMC&H, Ludhiana.

EXCLUSION CRITERIA:

- Age Less than 38 years and more than 55 years.
- Females with surgical menopause due to bilateral oophorectomy, irradiation and chemotherapy
- Females diagnosed with Alzheimer's disease and Pre senile dementia .
- History of pre existing anxiety and depressive disorders.
- Any history of substance abuse.
- Females with intellectual disability.
- Females taking any cognitive enhancers.

METHODOLOGY:

The study will be conducted on the 50 perimenopausal and 50 post-menopausal females in the age group of 38-55 years presenting to Department Of Psychiatry and obs and gyane, DMC&H Ludhiana . After clinical assessment, socio-demographic Performa will be filled. Subjects will be further assessed using MMSE, PGI memory scale and IQCODE Scale.

TOOLS: TO BE ATTACHED HEREWITH

MINI MENTAL STATE EXAMINATION (MMSE)

PGIMS (PGI MEMORY SCALE)

IQCODE (INFORMANT QUESTIONNAIRE ON COGNITIVE DECLINE)

1. MINI MENTAL STATE EXAMINATION –to be applied on the women of age group between 38-55 years old peri-menopausal females and postmenopausal females. It is 30 point questionnaire that is used to measure cognitive impairement. It includes 5 items that is Orientation (10 points), Registration(3 points), Attention and Calculation(5 points), Recall (3 points), Language and praxis(9 points).

   24-30 score =no cognitive decline

   18-23 score=Mild cognitive decline.

   0-17 score= severe cognitive decline.

2. PGI MEMORY SCALE: It is to be administered on above the age of 20 years. It contains 10 sub tests-

   1. Remote memory
   2. Recent memory,
   3. Mental balance,
   4. Attention and Concentration,
   5 Delayed recall,
   6. Immediate recall,
   7. Verbal retention for similar pairs,
   8. Verbal retention for dissimiliar pairs,
   9. Visual retention,
   10. Recognition.

3. INFORMANT QUESTIONNAIRE ON COGNITIVE DECLINE(IQCODE):
It contains 16 questions .To score the IQCODE, add up the score for each question and divide by the number of questions 16. The result is a score that ranges from 1 to 5. An average score of 3 means that the subject is rated as "no change" and score of 4 means a "bit worse" and a score of 5 is "much worse".

OUTCOME

To draw attention towards neurocognitive impairment in perimenopausal and postmenopausal females, who are at high risk, can experience cognitive decline affecting their day to day life. As there is increased risk of cognitive complaints, it's important to work on different domains of cognition, so early and repeated assessment of cognition is recommended. In this study, the level and the severity of impairment is to be assessed.

Statistical Analysis

Data will be described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using ANOVA. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test will be used when the expected frequency is less than 5. A probability value (p value) less than 0.05 will be considered statistically significant. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

NOT APPLICABLE.

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Attached herewith

LIST OF REFERENCES

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SOCIO DEMOGRAPHIC PROFORMA

S.NO. **DATE:**

1.NAME:

2.AGE:

3.MRD NO:

4.RELIGION: A)Hindu B)Sikh C)Muslim
D)Christian E)other

5.ADDRESS: A)Rural B)Urban

6.INCOME:

7.CONTACT NO:

9.OCCUPATION: A)Skilled B)Semiskilled C)Self skilled
D)Home maker E)Other

10.EDUCATION: A)Illiterate B)upto matriculation
c)higher secondary D)Graduation/Postgraduation

11.FAMILY TYPE: A)Nuclear B)Extended C)Joint D)Other

12.MARITAL STATUS: A) Single B)Married
C)Divorced D)Widow

13.BMI WEIGHT HEIGHT

14.CURRENT BP

15.OBST HISTORY:

16.MENSTRUAL HISTORY: ATTAINED MENARCHE ATAGE OF.....

LMP

MENSTRUAL FORMULA-DURATION

CYCLE-REGULAR/IRREGULAR

Signature of Candidate **Signature of Supervisor**

17. MEDICAL ILLNESS- DM/ HTN/ THYROID ILLNESS/ RENAL/LIVER/ CARDIOVASCULAR/ OTHER.

18. NUTRITIONAL ASSESSMENT: VEG/NON VEG

CALORIES

19. SURGICAL HISTORY

20 H/O OF TREATMENT WITH HORMONE REPLACEMENT THERAPY

21 SERUM ESTRADIOL LEVEL (E2)

SCALES:

MMSE SCORE GROUP: a) 24-30 b) 18-23 c) 0-17

PGI MEMORY SCALE:

IQCODE:

Signature of Candidate **Signature of Supervisor**

Mini-Mental State Examination (MMSE)

Patient's Name: _____ Date: _____

Instructions: ***Ask the questions in the order listed. Score one point for each correct response within each question or activity.***

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials: _____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, ...) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.)
30		TOTAL

(Adapted from Rovner & Folstein, 1987)

Source: www.medicine.uiowa.edu/igec/tools/cognitive/MMSE.pdf

Provided by NHCQF, 0106-410

Instructions for administration and scoring of the MMSE

Orientation (10 points):

- Ask for the date. Then specifically ask for parts omitted (e.g., "Can you also tell me what season it is?"). One point for each correct answer.
- Ask in turn, "Can you tell me the name of this hospital (town, county, etc.)?" One point for each correct answer.

Registration (3 points):

- Say the names of three unrelated objects clearly and slowly, allowing approximately one second for each. After you have said all three, ask the patient to repeat them. The number of objects the patient names correctly upon the first repetition determines the score (0-3). If the patient does not repeat all three objects the first time, continue saying the names until the patient is able to repeat all three items, up to six trials. Record the number of trials it takes for the patient to learn the words. If the patient does not eventually learn all three, recall cannot be meaningfully tested.
- After completing this task, tell the patient, "Try to remember the words, as I will ask for them in a little while."

Attention and Calculation (5 points):

- Ask the patient to begin with 100 and count backward by sevens. Stop after five subtractions (93, 86, 79, 72, 65). Score the total number of correct answers.
- If the patient cannot or will not perform the subtraction task, ask the patient to spell the word "world" backwards. The score is the number of letters in correct order (e.g., dlrow=5, dlorw=3).

Recall (3 points):

- Ask the patient if he or she can recall the three words you previously asked him or her to remember. Score the total number of correct answers (0-3).

Language and Praxis (9 points):

- Naming: Show the patient a wrist watch and ask the patient what it is. Repeat with a pencil. Score one point for each correct naming (0-2).
- Repetition: Ask the patient to repeat the sentence after you ("No ifs, ands, or buts."). Allow only one trial. Score 0 or 1.
- 3-Stage Command: Give the patient a piece of blank paper and say, "Take this paper in your right hand, fold it in half, and put it on the floor." Score one point for each part of the command correctly executed.
- Reading: On a blank piece of paper print the sentence, "Close your eyes," in letters large enough for the patient to see clearly. Ask the patient to read the sentence and do what it says. Score one point only if the patient actually closes his or her eyes. This is not a test of memory, so you may prompt the patient to "do what it says" after the patient reads the sentence.
- Writing: Give the patient a blank piece of paper and ask him or her to write a sentence for you. Do not dictate a sentence; it should be written spontaneously. The sentence must contain a subject and a verb and make sense. Correct grammar and punctuation are not necessary.
- Copying: Show the patient the picture of two intersecting pentagons and ask the patient to copy the figure exactly as it is. All ten angles must be present and two must intersect to score one point. Ignore tremor and rotation.

(Folstein, Folstein & McHugh, 1975)

Source: www.medicine.uiowa.edu/igec/tools/cognitive/MMSE.pdf

Provided by NHCQF, 0106-410

Interpretation of the MMSE

Method	Score	Interpretation
Single Cutoff	<24	Abnormal
Range	<21	Increased odds of dementia
	>25	Decreased odds of dementia
Education	21	Abnormal for 8th grade education
	<23	Abnormal for high school education
	<24	Abnormal for college education
Severity	24-30	No cognitive impairment
	18-23	Mild cognitive impairment
	0-17	Severe cognitive impairment

Sources:

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Source: www.medicine.uiowa.edu/igec/tools/cognitive/MMSE.pdf

Provided by NHCQF, 0108-410

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Consumable Booklet

of

PGIMS-PW

(English Version)

Dwarka Prasad (Chandigarh)

N. N. Wig (Chandigarh)

Please fill in the following informations :– Date ☐☐☐☐☐☐☐☐

Name _____

Father's Name _____ Sex : Male ☐ Female ☐

Education _____ Occupation _____

Age (Date of Birth) _____ Diagnosis _____

SCORING TABLE / PROFILE

	I	II	III	IV	V	VI	VII	VIII	IX	X	
Sub-Tests / P. Rank	Remote memory	Recent memory	Mental Balance	Attention & concentration	Delayed Recall	Immediate Recall	Retention for Similar Pairs	Retension fo Dissimilar Pairs	Visual Retention	Recognition	Total Score

Estd. 1971 www.npcindia.com ☎:(0562) 2464926

NATIONAL PSYCHOLOGICAL CORPORATION

4/230, KACHERI GHAT, AGRA-282 004 (INDIA)

I. **Remote Memory**

1. How old are you ? _____
2. Where were you born ? _____
3. When were you married ? _____
4. When did you start earning ? _____
5. When did you left study/pass high school ? _____
6. How old is your youngest child/brother/sister ? _____
7. When did you come first time in this clinic/department (Hospital) ? _____

II. **Recent Memory**

1. What did you eat in your last dinner ? _____
2. What did you eat this morning ? _____
3. What is the name of this month ? _____
4. What day is today ? _____
5. Who came to visit you or to whom you visited yesterday ? _____

III. **Mental Balance**

1. Recite A to Z (Alphabet of any language).
2. Count backward from 20 to 1.
3. Count backward by minusing 3s starting from 40.

IV. **Attention and Concentration**

1. I am going to say some numbers. Listen them carefully, when I read them, you will repeat them in the same order.

5-7-3		4-1-7	
5-3-8-7		6-1-5-8	
1-6-4-9-5		2-9-7-6-3	
3-4-1-7-9-6		6-1-5-8-3-9	
7-2-5-9-4-8-3		4-7-1-5-3-8-6	
4-7-2-9-1-6-8-5		9-2-8-8-3-1-7-4	

2. I am going to read some numbers but you will be required to repeat them backward. For example, I say 2, 5 you will say 5, 2.

8-5		2-8	
4-3-7		8-5-1	
8-5-6-3		3-7-5-9	
4-7-2-9-1		9-2-5-8-4	
2-5-9-4-8-3		7-1-5-3-9-6	
3-5-8-6-1-9-2		6-3-7-1-4-8-5	
8-5-2-3-6-1-9-4		2-8-4-5-9-7-1-3	

V. Delayed Recall

I am going to read the name of some objects, listen carefully and when I ask you to repeat, you will do so.
(Read at the rate of one word per second and ask the subject to repeat it after an interval of one minute.)

1		2	
Umbrella		Fish	
Flower		Lamp	
Clock		Rupee	
Picture		Taj	
Pencil		Toy	

VI. Immediate Recall

I am going to read a few small sentences one by one. Listen them carefully because when I am through I would like you to tell me the whole sentence as precisely as you can.

1. Ram got up from the chair, opened the door and went to market. ☐
2. Patient was asked to lie down on the table, he was seen, medicine was prescribed and was told to come next day. ☐
3. Mohan did not have water in his house, he picked-up the bucket, went to street well, filled it up and returned back. ☐

VII. Verbal Retention for Similar Pairs

Now, I am going to read to you a list of pairs, i.e., two words at a time. Listen carefully, when I name one word of the pair you will tell the second word of the pair (read the pairs at the rate of 2 seconds per pair, with a pause of 5 seconds between pairs ; give an interval of 10 seconds after reading last pair and then present a stimulus word of the pair and ask the subject to recall the 2nd word of the pair).

1.	Tree	Flower		
2.	Sweet	Sour		
3.	Man	Woman		
4.	Day	Night		
5.	Black	White		

VIII. Verbal Retention for Dissimilar Pairs

Instruction and administration procedure is the same as above for subtest VII, with a difference that stimulus words are to be presented in the order as mentioned for each of the trial. If subject fails to give correct answer, correct it and proceed to next stimulus word. If all his answers are correct in first trial

even then other two trials are to be completed but in no case, pairs be repeated, only incorrect answers are to be corrected.

Table	Black	4	2	1			
Tree	High	2	1	5			
Lamp	Uneven	1	5	3			
Child	Bitter	3	4	2			
Dream	Deep	5	3	4			

IX. Visual Retention

I am going to show you a card, see it carefully. After some time (15 seconds) I will take it away and when I ask you to draw (after 30 seconds) them, draw the things you saw in the card from your memory on this paper (give a paper, a pencil and an erasure to the subject but do not instruct whether he can use the erasure or not).

X. Recognition

Card is available in manual.

I am showing you a card containing pictures of many objects, see the whole card attentively (expose for 30 seconds). After some time (120 seconds inter val) I will place before you another card. From this you will be required to identify and name the objects you saw in earlier card (Do not tell the subject, the exact number of objects seen in first card and how many things he is yet to identify). Write the names given by the subject in the space given below.

Scoring Criteria for Various Items of Recognition Sub-test X

Give a score of one for correct identification and correct naming of an item.

Give half score for correct identification but wrong naming of an item.

Few subjects sometimes use different names for a particular item. Correct names for each item of this sub-test are given below. Any name other than those given here and only the description of the item, should be regarded as incorrect. However, if the examiner feels that the response given by the subject is not markedly wrong, he may give credit for that.

1. Lock = Lock/Lock-key/Close/Sed
2. Pen = Holder/Pencil/Ink/Refil
3. Fan = Fan/Ceiling fan/Electric Fan
4. Chair = Chair/Stool/Seat
5. Child = Boy/Girl/Lad/Doll/Baby
6. Comb = Disentangle, dress
7. Cot = Sofa/Charpai/Bed
8. Almirah=Door/Gudrej Shelf/Wooden Case/Almirah Radio, Fridge.
9. Knife = Cutter/Razer/Sword/Whittle
10. Book = Register/Volume/Monograph

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Consumable Booklet of P.G.I. Memory Scale (PGIMS-rw) English Version.

Short Form of the Informant Questionnaire on Cognitive Decline (Short IQCODE)

Try to remember what _____ (patient's name) was like 10 years ago and compare it with what he/she is like now. 10 years ago was in _____.

Below are situations requiring use of memory or intelligence and we want you to indicate whether this has improved, stayed the same, or got worse, over the past 10 years.

Note you are comparing the present performance with 10 years ago. So if 10 years ago he/she always forgot where he/she had left things, and he/she still does, then this would be answered "Not much change".

Please indicate the changes you have observed by circling the appropriate answer.

Compared with 10 years ago how is this person at:

	1	2	3	4	5
1. Remembering things about family and friends e.g. occupations, birthdays, addresses	Much improved	A bit improved	Not much change	A bit worse	Much worse
2. Remembering things that have happened recently	Much improved	A bit improved	Not much change	A bit worse	Much worse
3. Recalling conversations a few days later	Much improved	A bit improved	Not much change	A bit worse	Much worse
4. Remembering his/her address and telephone number	Much improved	A bit improved	Not much change	A bit worse	Much worse
5. Remembering what day and month it is	Much improved	A bit improved	Not much change	A bit worse	Much worse
6. Remembering where things are usually kept	Much improved	A bit improved	Not much change	A bit worse	Much worse
7. Remembering where to find things which have been put in a different place from usual	Much improved	A bit improved	Not much change	A bit worse	Much worse

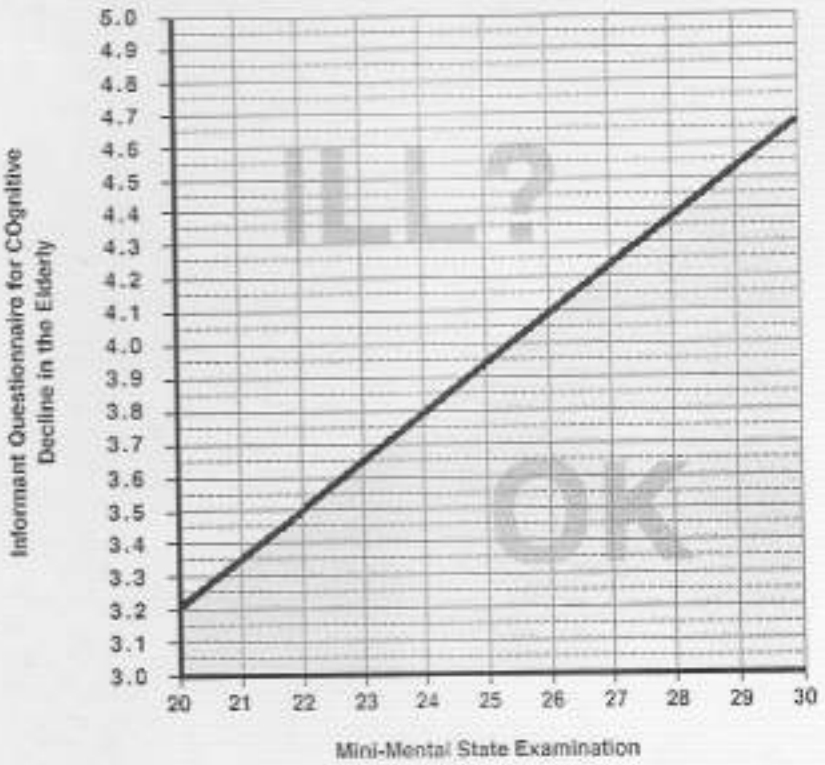
8. Knowing how to work familiar machines around the house	Much improved	A bit improved	Not much change	A bit worse	Much worse
9. Learning to use a new gadget or machine around the house	Much improved	A bit improved	Not much change	A bit worse	Much worse
10. Learning new things in general	Much improved	A bit improved	Not much change	A bit worse	Much worse
11. Following a story in a book or on TV	Much improved	A bit improved	Not much change	A bit worse	Much worse
12. Making decisions on everyday matters	Much improved	A bit improved	Not much change	A bit worse	Much worse
13. Handling money for shopping	Much improved	A bit improved	Not much change	A bit worse	Much worse
14. Handling financial matters e.g. the pension, dealing with the bank	Much improved	A bit improved	Not much change	A bit worse	Much worse
15. Handling other everyday arithmetic problems e.g. knowing how much food to buy, knowing how long between visits from family or friends	Much improved	A bit improved	Not much change	A bit worse	Much worse
16. Using his/her intelligence to understand what's going on and to reason things through	Much improved	A bit improved	Not much change	A bit worse	Much worse

To score the IQCODE, add up the score for each question and divide by the number of questions (16).

The result is a score that ranges from 1 to 5.

An average score of 3 means that the subject is rated as 'no change'.
A score of 4 means 'a bit worse', and a score of 5 is 'much worse'.

The average score from the IQCODE is plotted on the "DemeGraph" below along with the score from the MMSE to assess the likelihood of the patient having dementia.



Patients whose score profile falls above the diagonal line (the unshaded portion of the graph) are likely to meet criteria for DSM-IV Dementia.

Patients who fall below the line (the shaded part of the graph) are unlikely to meet the criteria for this disorder.

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o.....
.....am willing to participate in the study **"TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

....
Signature of the Witness Signature of the patient

Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य **"TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"TO STUDY NEUROCOGNITIVE IMPAIRMENT IN PERIMENOPAUSAL AND POSTMENOPAUSAL FEMALES" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

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ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ

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ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____

ਪਤਾ _____

ਮਿਤੀ_____

ਪਤਾ _____

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ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

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ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ